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State of Health of the People of Canada in 1942*

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THE state of health of the people of Canada during 1942 might be termed excellent. This is all the more significant when some of the adverse conditions which existed in certain parts of the country are taken into consideration. For instance, under the influence of total war some of the factors which are normally considered to be detrimental to the health of the people were that—

(1) Industry was required to increase its production tempo, with resultant longer hours of labour and increased industrial hazards.
(2) Housing conditions in certain urban areas were such as to create serious problems of over-crowding.
(3) Transportation systems were crowded beyond the limit of normal capacity.
(4) There were many abnormal conditions which under ordinary circumstances would not be conducive to good health.

The impact of war in the British Isles was even more directly focused upon the population, yet there too a similar general trend of improvement in health conditions of the people is observed in the vital statistics.

**Based on preliminary figures, exclusive of Yukon and Northwest Territories.*

The influences for the betterment of the health of the Canadian people were found in many directions. On the one hand the general upward trend in the birth rate was being maintained while the incidence of communicable diseases was very low. There were no major epidemics with the exception of localized outbreaks of diphtheria and scarlet fever, which indicate the need for increasing the present ratio of immunization among the civilian population. Among the childhood type of infectious diseases there was an increase in the incidence of chicken-pox and whooping-cough but substantial reductions were evident in measles, typhoid fever, influenza, etc. There were also reductions in the rate of infant and maternal mortality, the general death rate, and the death rate from tuberculosis, pneumonia, nephritis and even for such diseases of later life as intracranial lesions of vascular origin and diseases of the arteries.

There was no recurrence, in epidemic proportions, of the 1941 outbreak of poliomyelitis and encephalomyelitis in the Prairie Provinces of Manitoba and Saskatchewan, although the mortality rate for the former disease was almost as high (0.5) as that for 1941 at which time under epidemic conditions the rate was 0.6 per 100,000 population.

The upward trend in cancer mortality in North America, generally, appears to be diminishing. The United States experience is almost in line with that of Canada—the rapidly rising mortality rates of the past three or four decades show every indication of tapering off.

The use of sulpha drugs has been responsible in a large measure for the low mortality from respiratory diseases and the reduction of maternal mortality.

This favourable record for 1942 speaks well for the control measures which have been instituted to prevent the spread of disease and reduce the accident toll in industry.

Another factor which is said to have had a beneficial influence on individual health is that while living costs have been rising, the war has caused a more even distribution of basic foods; having a greater purchasing power, the poorer classes are able to secure the necessities of life.

POPULATION

The population of Canada, exclusive of Yukon and the Northwest Territories, was 11,636,872, as of June 1, 1942, according to the preliminary estimates of the Dominion Bureau of Statistics.

BIRTHS

The number of births in 1942 was 271,981, with a birth rate of 23.4, which is again slightly higher than for the preceding year, when the rate was 22.2. The increase in the birth rate is being maintained in all provinces except Saskatchewan, where the birth rate fell from 20.6 in 1941 to 20.0 in 1942. Quebec led all provinces with a rate of 28.0 as compared with 26.8 last year, closely followed by New Brunswick with a rate of 27.2 for 1942 as against 26.8 in 1941. Nova Scotia and British Columbia recorded the highest ratio increases of 1.9 and 2.0, with the latter province steadily

increasing her position in the matter of birth rates in relation to the rest of Canada.

TABLE I

BIRTH RATES PER 1,000 POPULATION FOR CANADA AND THE PROVINCES, 1942

CANADA	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.
23.4	22.2	26.0	27.2	28.0	20.4	21.2	20.0	22.6	20.4

NUMBER OF BIRTHS AND BIRTH RATES PER 1,000 POPULATION, 1928 TO 1942

Year	Births	Rates	Year	Births	Rates	Year	Births	Rates
1928	236,757	24.1	1933	222,868	20.9	1938	229,446	20.5
1929	235,415	23.5	1934	221,303	20.5	1939	229,468	20.3
1930	243,495	23.9	1935	221,451	20.3	1940	244,316	21.5
1931	240,473	23.2	1936	220,371	20.0	1941	255,317	22.2
1932	235,666	22.5	1937	220,235	19.8	1942	271,981	23.4

MARRIAGES

There was an increase in the number of marriages during the year, with the abnormality of war influence still apparent. The number in 1942 was 127,368 compared with 121,842 in 1941, 123,318 in 1940, 103,658 in 1939 and 88,438 in 1938. The table of marriage numbers and rates, following, shows the great influence war plays in the increase of marriages as well as the decreasing influence of the depression years, and that 1942 is the highest on record.

TABLE II

MARRIAGE RATES PER 1,000 POPULATION FOR CANADA AND THE PROVINCES, 1942

CANADA	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.
10.9	8.1	11.7	10.6	10.0	11.9	11.4	8.0	11.2	13.1

NUMBER OF MARRIAGES AND MARRIAGE RATES PER 1,000 POPULATION, 1928 TO 1942

Year	Marriages	Rates	Year	Marriages	Rates	Year	Marriages	Rates
1928	74,311	7.6	1933	63,865	6.0	1938	88,438	7.9
1929	77,288	7.7	1934	73,092	6.8	1939	103,658	9.2
1930	71,657	7.0	1935	76,893	7.0	1940	123,318	10.8
1931	66,591	6.4	1936	80,904	7.3	1941	121,842	10.6
1932	62,531	6.0	1937	87,800	7.9	1942	127,368	10.9

DEATHS

The number of deaths in 1942 at all ages and from all causes was 112,864 compared with 114,639 in 1941, and 110,927 in 1940. The death rate has declined from last year. In 1942 it was 9.7; in 1941 it was 10.0 and in 1940 it was 9.8. New Brunswick had the highest death rate in 1942 with 11.1, Nova Scotia was second with 10.8, and Saskatchewan was again the lowest with 6.8. In comparing the provincial death rates, however, it is necessary to keep in mind that the age composition of the two maritime provinces is much older than in Saskatchewan, and, therefore, a higher death rate is expected in the two former provinces.

TABLE III

DEATH RATES PER 1,000 POPULATION FOR CANADA AND THE PROVINCES, 1942

CANADA	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.
9.7	10.0	10.8	11.1	10.0	10.2	8.7	6.8	7.5	10.7

NUMBER OF DEATHS AND DEATH RATES PER 1,000 POPULATION, 1928 TO 1942

Year	Deaths	Rates	Year	Deaths	Rates	Year	Deaths	Rates
1928	109,057	11.1	1933	101,968	9.6	1938	106,817	9.5
1929	113,515	11.3	1934	101,582	9.4	1939	108,951	9.6
1930	109,306	10.7	1935	105,567	9.7	1940	110,927	9.8
1931	104,517	10.1	1936	107,050	9.7	1941	114,639	10.0
1932	104,377	9.9	1937	113,824	10.2	1942	112,864	9.7

INFANT MORTALITY

In 1942 Canadian children who died before their first birthday numbered 14,637 in comparison with 15,236 in 1941, and 13,783 in 1940. The death rate for infants in 1926 was 102 per 1,000 live births, but by 1940 it had dropped to 56; in 1941 it rose to 60, but in 1942 it dropped again to 54. These figures reveal the very significant improvement that has been brought about in infant deaths. This encouraging general decrease speaks very highly for the efforts of Canada's public health officials who have supplied ever-increasing facilities for pre-natal, intra-natal and post-natal care. New Brunswick had the highest rate with 77, Quebec was second with 70, and British Columbia was lowest with 35. All provincial rates reflect a considerable improvement over the past fifteen years.

TABLE IV

DEATH RATES OF CHILDREN UNDER ONE YEAR PER 1,000 POPULATION, 1942

CANADA	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.
54	50	58	77	70	40	51	43	38	35

NUMBER OF DEATHS UNDER ONE YEAR AND DEATH RATES PER 1,000 LIVE BIRTHS, 1928 TO 1942

Year	Deaths	Rates	Year	Deaths	Rates	Year	Deaths	Rates
1928	21,195	90	1933	16,284	73	1938	14,517	63
1929	21,674	92	1934	15,870	72	1939	13,939	61
1930	21,742	89	1935	15,730	71	1940	13,783	56
1931	20,360	85	1936	14,574	66	1941	15,236	60
1932	17,263	73	1937	16,693	76	1942	14,637	54

MATERNAL MORTALITY

The definite, continuous improvement which is being maintained in respect of maternal mortality which was noted during the past several years was again reflected in the 1942 death rate. The number of deaths during

the year was 806, in 1941 it was 901 and in 1940 it was 978. The death rate in 1942 was 3.0 compared with 3.5 in 1941 and 4.0 in 1940. Canada's maternal mortality rate in 1926 was 5.7 per 1,000 live births and the halving of the rate by 1942 is very significant of the improvements provided for the care of Canadian mothers during childbirth. In 1937 Canada stood 21st in a list of 28 leading countries of the world in the maternal mortality rates, but incomplete figures for the same countries show that Canada's position in this respect has been greatly improved.

New Brunswick had the highest rate during the year, 4.5, while Alberta and British Columbia had the lowest, 2.4.

TABLE V

DEATH RATES PER 1,000 LIVE BIRTHS FOR CANADA AND THE PROVINCES, 1942

CANADA	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.
3.0	4.2	2.7	4.5	3.3	2.6	2.6	3.4	2.4	2.4

NUMBER OF DEATHS AND DEATH RATES PER 1,000 LIVE BIRTHS FROM PUERPERAL CAUSES, 1928 TO 1942

Year	Deaths	Rates	Year	Deaths	Rates	Year	Deaths	Rates
1928	1,331	5.6	1933	1,111	5.0	1938	968	4.2
1929	1,341	5.7	1934	1,167	5.3	1939	967	4.2
1930	1,405	5.8	1935	1,093	4.9	1940	978	4.0
1931	1,215	5.1	1936	1,233	5.6	1941	901	3.5
1932	1,181	5.0	1937	1,071	4.9	1942	806	3.0

TEN LEADING CAUSES OF DEATH

Table VI gives the number of deaths in Canada from the 10 leading causes for the ten years 1933 to 1942, placed in order of rating for 1942 and indicating: (a) the rating for each year, (b) the number of deaths, (c) the ratio of each cause to the total deaths, and (d) the crude death rate per 100,000 population.

CARDIO-VASCULAR—RENAL DISEASES

Each year we have to note the continuous increasing toll of life exacted by this triad of diseases, although it is to be expected that if the efforts of public health to prolong life are in any way effective, an ever-increasing mortality will of necessity be found in the diseases of the upper ages.

(A) HEART. Diseases of the heart claimed 27,506 lives in 1942, compared with 26,602 in 1941 and 20,278 in 1940. The death rate for 1942 was 236.4 per 100,000; in 1941 it was 231.5 and in 1940 it was 178.3. Ontario had the highest death rate from heart diseases, 315.3, with British Columbia a close second with 310.5; this is to be expected as Ontario is the largest industrial province and British Columbia has a relatively high age composition. Saskatchewan was again the lowest province with a rate of 152.2.

TABLE VI

TEN LEADING CAUSES OF DEATH IN CANADA[1], 1933-42.

YEAR	DISEASES OF THE HEART		CANCER (ALL FORMS)		ACCIDENTAL OR VIOLENT DEATHS		NEPHRITIS		DISEASES OF THE ARTERIES		DISEASES PECULIAR TO THE FIRST YEAR OF LIFE		TUBERCULOSIS (ALL FORMS)		PNEUMONIA (ALL FORMS)		INTRACRANIAL LESIONS OF VASCULAR ORIGIN		INFLUENZA (ALL FORMS)	
	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS	RATING	No. OF DEATHS
1933	1	15,485	2	10,653	7	6,216	8	5,516	4	6,950	3	7,337	5	6,939	6	6,487	10	3,198	9	4,019
1934	1	16,352	2	10,581	6	6,469	8	5,643	3	7,379	4	6,936	7	6,431	5	6,530	9	3,124	10	2,004
1935	1	16,069	2	11,156	5	6,898	8	6,176	3	8,302	6	6,880	7	6,597	4	7,411	10	2,520	9	3,392
1936	1	16,424	2	11,694	4	7,463	8	6,402	3	9,112	7	6,605	6	6,763	5	7,313	10	2,248	9	3,113
1937	1	16,840	2	11,963	5	7,358	8	6,530	3	9,609	7	6,644	6	6,669	4	7,731	10	2,005	9	5,260
1938	1	17,373	2	12,038	5	7,205	7	6,492	3	9,970	6	6,598	8	6,126	4	7,432	10	2,016	9	2,362
1939	1	18,562	2	12,399	4	7,173	6	6,538	3	10,884	7	6,174	8	5,977	5	6,596	10	2,060	9	3,955
1940	1	20,278	2	13,322	4	7,418	5	6,835	3	11,742	6	6,318	8	5,789	7	6,132	10	2,296	9	2,789
1941	1	26,602	2	13,417	3	8,442	4	7,399	5	6,733	6	6,252	7	6,072	8	5,955	9	4,567	10	2,411
1942(2)	1	27,506	2	13,643	3	8,127	4	7,222	5	6,511	6	6,020	7	5,991	8	5,771	9	4,467	10	1,219

YEAR	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION	PER CENT OF TOTAL DEATHS	RATE PER 100,000 POPULATION
1933	15.2	145.2	10.4	99.9	6.1	58.3	5.4	51.7	6.8	65.2	7.2	68.8	6.8	65.1	6.4	60.8	3.1	30.0	3.9	37.7
1934	16.1	151.3	10.4	97.9	6.4	59.8	5.6	52.2	7.3	68.3	6.8	64.2	6.3	59.5	6.4	60.4	3.1	28.9	2.0	18.5
1935	15.2	147.1	10.6	102.2	6.5	63.2	5.9	56.6	7.9	76.0	6.5	63.0	6.2	60.4	7.0	67.9	2.4	23.1	3.2	31.1
1936	15.3	149.1	10.9	106.2	7.0	67.8	6.0	58.1	8.5	82.7	6.2	60.0	6.3	61.4	6.8	66.4	2.1	20.4	2.9	28.3
1937	14.8	151.6	10.5	107.7	6.5	66.3	5.7	58.8	8.4	86.5	5.8	59.8	5.9	60.0	6.8	69.6	1.8	18.1	4.6	47.4
1938	16.3	155.2	11.3	107.5	6.7	64.4	6.1	58.0	9.3	89.1	6.2	58.9	5.7	54.7	7.0	66.4	1.9	18.0	2.2	21.1
1939	17.0	164.3	11.4	109.7	6.6	63.5	6.0	57.9	10.0	96.3	5.7	54.6	5.5	52.9	6.1	58.4	1.9	18.2	3.6	35.0
1940	18.3	178.3	12.0	117.2	6.7	65.2	6.2	60.1	10.6	103.3	5.7	55.6	5.2	50.9	5.5	53.9	2.1	20.2	2.5	24.5
1941	23.2	231.5	11.7	116.8	7.4	73.5	6.5	64.4	5.9	58.6	5.5	54.4	5.3	52.8	5.2	51.8	4.0	39.7	2.1	21.0
1942(2)	24.4	236.4	12.1	117.2	7.2	69.8	6.4	62.1	5.8	56.0	5.3	51.7	5.3	51.5	5.1	49.6	4.0	38.4	1.1	10.5

(1) EXCLUSIVE OF YUKON AND THE NORTHWEST TERRITORIES.

(2) PRELIMINARY FIGURES.

NOTE - IT SHOULD BE NOTED THAT THE EFFECTS OF CERTAIN CHANGES IN CLASSIFICATION AND RE-ARRANGEMENT OF TITLES PROVIDED IN THE FIFTH REVISION OF THE INTERNATIONAL LIST OF CAUSES OF DEATH ARE APPARENT IN THE FOLLOWING: TUBERCULOSIS, DISEASES OF THE HEART, DISEASES PECULIAR TO THE FIRST YEAR OF LIFE.

The total deaths from diseases of the heart during 1941 and 1942 have been influenced to a large extent by the addition of some 4,467 and 4,244 attributed to intracranial lesions of vascular origin associated with arteriosclerosis, formerly classified under diseases of the arteries. This change in classification has been brought about through the Fifth Revision of the International List of Causes of Death; even without the addition of deaths associated with arteriosclerosis the increase in deaths from diseases of the heart is still maintained.

TABLE VII

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
HEART—INTERNATIONAL LIST NOS.: (1929) 90-95; (1938) 90-95

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths	15,485	16,352	16,069	16,424	16,840	17,373	18,562	20,278	26,602	27,506
Rate	145.2	151.3	147.1	149.1	151.6	155.2	164.3	178.3	231.5	236.4

(B) ARTERIES. Arterial disease mortality appeared to show a decrease in 1941 over previous years, but this was almost entirely due to a change in classification of arteriosclerosis when associated with other causes as called for by the 1938 revision of the International List of Causes of Death; however, taking into account this factor the deaths from diseases of the arteries in 1942 showed a decrease from 6,733 in 1941 to 6,511. In 1940 under the old classification the number of deaths was 11,742. The death rate for 1942 was 56.0; in 1941 it was 58.6 while in 1940 it was 103.3. Ontario had the highest rate, 81.1, and Quebec the lowest, 31.4.

TABLE VIII

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
ARTERIES—INTERNATIONAL LIST NOS.: (1929) 96, 97, 99, 102; (1938) 83e, 96, 97, 99, 102

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths	6,950	7,379	8,302	9,112	9,609	9,970	10,884	11,742	6,733	6,511
Rate	65.2	68.3	76.0	82.7	86.5	89.1	96.3	103.3	58.6	65.0

(C) NEPHRITIS. There was a decrease in the number of deaths from nephritis in 1942, when the number was 7,222 compared with 7,399 in 1941 and 6,835 in 1940. The death rate was 62.1; in 1941 it was 64.4 and in 1940 it was 60.1. Quebec had the highest death rate, 97.2, and Manitoba the lowest, 29.0.

TABLE IX

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
NEPHRITIS—INTERNATIONAL LIST NOS.: (1929) 130-132; (1938) 130-132

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths	5,516	5,643	6,176	6,402	6,530	6,492	6,538	6,835	7,399	7,222
Rate	51.7	52.2	56.6	58.1	58.8	58.0	57.9	60.1	64.4	62.1

INTRACRANIAL LESIONS OF VASCULAR ORIGIN

The number of deaths caused by cerebral haemorrhage, cerebral embolism and thrombosis in 1941 seemed to indicate a sharp rise in both the number of deaths and the death rate; however, the increase was almost entirely due to the fact that deaths under this heading, when associated with arteriosclerosis, were transferred from diseases of the arteries. The number of deaths from this group of causes decreased in 1942 to 4,467 as compared with 4,567 in 1941. In 1940 under the previous classification there were 2,296 deaths. The death rate fell from 39.7 in 1941 to 38.4 in 1942. In 1940 the death rate was 20.2.

New Brunswick had the highest death rate, 48.6, followed by Ontario with 47.8. Saskatchewan had the lowest rate with 27.8. These diseases are more prevalent in the provinces which have an older age composition of population.

CANCER

Each year the number of deaths reported from all forms of cancer continues to increase, although there are further indications that the peak in the rate at least may be in sight, there being a rise of only 0.4 in 1941 and 1942 as against rises of 5.0 and 6.0 of a few years ago. In 1942 there were 13,643 deaths; in 1941 there were 13,417 and in 1940 there were 13,322. The death rate in 1942 was 117.2 as compared with 116.8 in 1941 and 117.2 in 1940. British Columbia had the highest rate again this year, 144.3, followed by Ontario with 130.8. Saskatchewan displaced Alberta as the lowest with 83.4. The wide variation in the rates of the respective provinces is due largely to the differences in age composition.

TABLE X

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
CANCER—INTERNATIONAL LIST NOS.: (1929) 45-53; (1938) 45-55

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths .	10,653	10,581	11,156	11,694	11,963	12,038	12,399	13,322	13,417	13,643
Rate . . .	99.9	97.9	102.2	106.2	107.7	107.5	109.7	117.2	116.8	117.2

COMMUNICABLE DISEASES

Communicable diseases reported, exclusive of syphilis, gonorrhoea and minor communicable diseases, amounted to 178,418 as compared with 255,031 in 1941. The number of deaths attributable to the communicable diseases was 14,844 compared with 16,523 in 1941. This is a considerable decrease in both morbidity and mortality, especially when compared with the increase of 1941 over 1940 when the cases numbered 161,574 and the deaths 16,445. The death rate per 100,000 population was 127.6 in 1942, 148.6 in 1941 and 144.6 in 1940. The ratio of deaths per 100 cases was 8.3 compared with 6.5 in 1941 and 10.2 in 1940. It may, therefore, be noticed that although there was a decrease in the number of cases and the death rate

per 100,000 population, the ratio of deaths per 100 cases was higher than in 1941.

MEASLES. In 1942 the number of cases of measles dropped to third place in prevalence among the communicable diseases.

In 1942 there were 26,258 cases compared with 81,051 in 1941 and 45,851 in 1940. The median for 1936 to 1940 was 45,851. The number of deaths in 1942 was 130 and the death rate 1.1. In 1941 the figures were 325 and 2.8, respectively, and in 1940, 168 and 1.5, respectively. This was a considerable decrease over the death rates for 1941 and 1940. The deaths per 100 cases were 0.5 as compared with 0.4 in 1941 and 0.4 in 1940. Quebec had the highest death rate, 2.3, Saskatchewan was second with 1.7, and Prince Edward Island lowest with no deaths.

TABLE XI

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
MEASLES—INTERNATIONAL LIST NOS.: (1929) 7; (1938) 35

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths.	170	188	490	376	837	250	197	168	325	130
Rate...	1.6	1.7	4.5	3.4	7.5	2.2	1.7	1.5	2.8	1.1

RUBELLA (*German Measles*). There were 4,511 cases of this disease reported as against the epidemic figure of 56,777 in 1941, and 4,621 cases in 1940. In 1942 there was one death compared with eight in 1941 and one in 1940.

CHICKENPOX. There were 30,914 cases of this disease in 1942 compared with 27,867 in 1941 and 32,758 in 1940. The median for the five years 1926 to 1940 was 25,435. The number of deaths for 1942 was 28 as compared with 19 in 1941 and 26 in 1940. The death rate in 1942 was 0.24, in 1941 it was 0.16 and in 1940 it was 0.22.

SMALLPOX. There were 6 cases of smallpox reported in 1942 and no deaths. In 1941 there were 26 cases and no deaths, and in 1940 there were 11 cases and no deaths. The median prevalence for the five years 1936 to 1940 was 62 cases and the average was 2 deaths. The national smallpox experience over the past 20 years indicates that except for sporadic outbreaks this disease has been brought under control by the extensive vaccination programs that have been carried on in all provinces.

MUMPS. In 1942 there were 52,344 cases of mumps reported as compared with 22,936 in 1941 and 13,498 in 1940. These figures and the median prevalence of this disease for the five-year period 1936 to 1940 of 13,498, indicates the presence of an epidemic of mumps in the fall of 1941 and the spring of 1942. In 1942 Ontario reported 16,806, British Columbia 13,580, and Quebec 9,760 cases. In 1942 there were 46 deaths and the death rate was 0.4, as compared with 19 deaths and a rate of 0.2 in 1941 and 18 deaths and a death rate of 0.2 in 1940.

SCARLET FEVER. There were 20,648 cases of this disease reported in 1942 with 128 deaths and a death rate of 1.1. In 1941 there were 16,966

cases with 117 deaths and a death rate of 1.0. In 1940 there were 13,712 cases with 125 deaths and a death rate of 1.1. The median prevalence for the five-year period 1936 to 1940 was 16,735 cases, an average of 201 deaths and an average death rate of 1.8, so that this disease in 1942 was above its median prevalence in cases but below the average in number of deaths and death rates. Nova Scotia had the highest death rate, 1.7, Quebec was second with 1.5 and Prince Edward Island was lowest with no deaths.

It should be stressed once again that the incidence of scarlet fever in Canada is far too high, and illustrates the need for a more satisfactory immunizing agent. Every effort should be put forward to take advantage of the means at our disposal for the control of this disease.

TABLE XII

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
SCARLET FEVER—INTERNATIONAL LIST NOS.: (1929) 8; (1938) 8

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths	157	226	242	244	269	202	167	125	117	128
Rate	1.5	2.1	2.2	2.2	2.4	1.8	1.5	1.1	1.0	1.1

DIPHTHERIA. There was an increase in both cases and deaths for this disease again in 1942. The number of cases was 2,955 with 256 deaths and a death rate of 2.2. In 1941 there were 2,866 cases with 240 deaths and a death rate of 2.1, and in 1940 cases numbered 2,335 with 213 deaths and a death rate of 1.9. The median for the five years 1936 to 1940 was 2,897, the average deaths were 322, and the average death rate, 2.9. Quebec had the highest number of cases, 1,272, and Nova Scotia was second with 887, but the highest death rate was recorded in Nova Scotia, 10.7, with New Brunswick second with 4.9, and the lowest rate was in British Columbia, 0.2. The above figures appear to stress the need for stepping up the immunization program for the control of diphtheria.

TABLE XIII

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
DIPHTHERIA—INTERNATIONAL LIST NOS.: (1929) 10; (1938) 10

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths	239	232	264	258	369	434	336	213	240	256
Rate	2.2	2.1	2.4	2.3	3.3	3.9	3.0	1.9	2.1	2.2

WHOOPING-COUGH. There were 18,384 cases of this disease in 1942 and 559 deaths. The death rate was 4.8. The median prevalence for the five-year period 1936 to 1940 was 17,217, and the average number of deaths was 604. The death rate in 1941 was 3.8 and in 1940 it was 5.5. The average death rate for the five years 1936 to 1940 was 5.4. Prince Edward Island's death rate of 12.5 was again the highest in 1942, New Brunswick was second with 12.3 and Manitoba and Saskatchewan were lowest with 1.5.

ACUTE POLIOMYELITIS AND POLIOENCEPHALITIS. The number of

cases in 1942 was 687 with 64 deaths and a death rate of 0.5. In 1941, an epidemic year, cases numbered 1,881 with 68 deaths and a death rate of 0.6; in 1940 there were 192 cases with 48 deaths and a death rate of 0.4. The median for the five-year period 1936 to 1940 was 577 cases with an average of 97 deaths and an average death rate of 0.9. The death rate per 100 cases was 9.3, whereas in 1941 it was 3.6 and in 1940 it was 25.0.

TABLE XIV

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
POLIOMYELITIS—INTERNATIONAL LIST NOS.: (1929) 16; (1938) 36

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths	73	84	64	97	200	83	56	48	68	64
Rate	0.7	0.8	0.6	0.9	1.8	0.7	0.5	0.4	0.6	0.5

CEREBROSPINAL MENINGITIS. There were 765 cases of this disease reported in 1942 with 147 deaths and the death rate was 1.3. In 1941 there were 1,465 cases with 206 deaths and the death rate was 1.8. In 1940 there were 374 cases with 100 deaths and the death rate was 0.9.

ENCEPHALITIS LETHARGICA.* There were 81 cases of this disease reported in 1942 with 65 deaths, and the death rate was 0.6. In 1941 there were 1,133 cases with 179 deaths and the death rate was 1.6. In 1940 there were 32 cases reported, with 63 deaths and a death rate of 0.6.

INFLUENZA. Although the ratio of under-reporting of this disease continues to be very high, it is still possible from the number of cases reported to recognize the trend of the more serious types where the physician is summoned. In 1942 there were 3,397 cases and in 1941 there were 9,656, while in 1940 there were 13,704. In 1942 there were 1,219 deaths compared with 2,411 in 1941 and 2,789 in 1940. The deaths together with the cases reported over the past several years suggest that the incidence of the more virulent types of this disease at least has been steadily decreasing, or that there has been improvement in treatment. The death rate for 1942 was 10.5; for 1941 it was 21.0 and for 1940 it was 24.5. The average death rate for the five years 1936 to 1940 was 31.2, while the case median was 13,704. Nova Scotia had the highest death rate, 16.0, Prince Edward Island was second, 15.6, and Ontario was lowest, 7.0.

TABLE XV

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
INFLUENZA—INTERNATIONAL LIST NOS.: (1929) 11; (1938) 33

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths	4,019	2,004	3,392	3,113	5,260	2,362	3,955	2,789	2,411	1,219
Rate	37.7	18.5	31.1	28.3	47.4	21.1	35.0	24.5	21.0	10.5

PNEUMONIA. In 1942 there were 2,048 cases of pneumonia reported, as compared with 1,822 in 1941 and 2,114 in 1940. The median prevalence

**Encephalomyelitis is included under this title in the International List of Causes of Death. In 1941 there were 1,109 cases reported with 23 deaths and a death rate of 0.2.*

for the five years 1936 to 1940 was 1,889. There was a further encouraging reduction in the number of deaths from this disease. The consistent decreases in the death rate indicate that the new treatments for pneumonia are having beneficial results. There were 5,771 deaths in 1942 compared with 5,955 in 1941 and 6,132 in 1940. The death rate in 1942 was 49.6, in 1941 it was 51.8 and in 1940 it was 53.9. The average death rate for the five years 1936 to 1940 was 62.9. New Brunswick had the highest rate, 84.1, Prince Edward Island was second, 64.5, while Alberta displaced Saskatchewan by 0.1 with a rate of 41.5.

TABLE XVI

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
PNEUMONIA—INTERNATIONAL LIST NOS.: (1929) 107-109; (1938) 107-109

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths .	6,487	6,530	7,411	7,313	7,731	7,432	6,596	6,132	5,955	5,771
Rate . . .	60.8	60.4	67.9	66.4	69.6	66.4	58.4	53.9	51.8	49.6

TUBERCULOSIS. There were 11,814 new cases of tuberculosis (all forms) reported in 1942, as compared with 10,473 in 1941 and 10,226 in 1940. Deaths in 1942 numbered 5,991 compared with 6,072 in 1941 and 5,789 in 1940. In 1942 the death rate was 51.5, in 1941 it was 52.8, in 1940 it was 50.9, while the average death rate for the five years 1936 to 1940 was 55.9. The figures for the past fifteen years reveal that a gradual downward trend is being maintained. Quebec had the highest death rate, 80.2, New Brunswick was second, 71.0, and Saskatchewan was lowest, 28.2.

TABLE XVII

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
TUBERCULOSIS—INTERNATIONAL LIST NOS.: (1929) 23-32; (1938) 13-22

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths .	6,939	6,431	6,597	6,763	6,669	6,126	5,977	5,789	6,072	5,991
Rate . . .	65.1	59.5	60.4	61.4	60.0	54.7	52.9	50.9	52.8	51.5

The following table based for 1940 to 1942 on the estimated population at mid-year 1939 for England and Wales, indicates that the upward trend of the disease which was apparent during the first months of war has been arrested and that in 1942 the rate had dropped below the pre-war level.

TABLE XVIII

TUBERCULOSIS—ENGLAND AND WALES

	Respiratory		Other Forms	
	Number of Deaths	Rate per 100,000 Population	Number of Deaths	Rate per 100,000 Population
1938	21,260	51.6	4,258	10.3
1939	21,543	52.0	4,080	9.8
1940	23,660	57.1	4,484	10.8
1941	23,633	57.0	5,036	12.1
1942	20,987	50.6	4,557	11.0

SYPHILIS. There were 957 deaths reported with a death rate of 8.2 in comparison with 913 deaths and a death rate of 7.9 in 1941, and 487 deaths with a death rate of 4.3 in 1940. The average rate for the five years 1936 to 1940 was 4.8. These figures do not represent the actual mortality from syphilis, as many deaths which are directly caused by the disease are reported under other causes. However, the decided increases for 1941 and 1942 are more apparent than real and are due for the most part to the change in groupings and classification recommended at the 1938 Revision of the International List of Causes of Death. The following diseases formerly shown under other titles are now included in title 30, Syphilis: (a) Locomotor ataxia (tabes dorsalis), (b) General paralysis of the insane, and (c) Aneurysm of the aorta.

DIARRHOEA AND ENTERITIS. There was a further increase in the mortality from these diseases in 1942, when the number of deaths was 2,395 and the death rate 20.6. In 1941 there were 2,319 deaths and the death rate was 20.2, in 1940 there were 1,891 deaths and the death rate was 16.6, while the average death rate for the five years 1936 to 1940 was 24.0. New Brunswick displaced Quebec as the province with the highest rate, with 56.8 compared with 39.6 for the latter, while British Columbia was lowest, 5.3.

TYPHOID AND PARATYPHOID. There was a very considerable reduction in both the number of cases and deaths from these diseases. In 1942 there were 1,142 cases and 108 deaths in comparison with 1,550 cases and 165 deaths in 1941, 1,570 cases and 224 deaths in 1940 and a five-year median of 1,722 cases and an average of 239 deaths for 1936 to 1940. The death rate for 1942 was 0.9, while the ratio of deaths per 100 cases was 9.5 as compared with a death rate of 1.4 and a ratio of 10.6 in 1941 and 2.0 and 14.3, respectively, for 1940. The morbidity and mortality in 1942 were the lowest on record. Quebec had the highest death rate, 2.2, New Brunswick was second with 1.7 and Alberta was lowest with 0.1.

TABLE XIX

DEATHS AND DEATH RATES PER 100,000 POPULATION FOR THE YEARS 1933 TO 1942
TYPHOID AND PARATYPHOID—INTERNATIONAL LIST NOS.: (1929) 1, 2; (1938) 1, 2

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Deaths.	291	293	273	256	330	207	180	224	165	108
Rate...	2.7	2.7	2.5	2.3	3.0	1.8	1.6	2.0	1.4	0.9

UNDULANT FEVER. There were 152 cases of this disease reported in 1942 with 8 deaths and a death rate of 0.07 as compared with 168 cases, 4 deaths and a rate of 0.03 in 1941, and 146 cases, 9 deaths and a death rate of 0.08 in 1940. The median prevalence of this disease for the five years 1936 to 1940 was 161, the average number of deaths, 8, and the average death rate, 0.07.

ROCKY MOUNTAIN SPOTTED FEVER. There were 1 case and 1 death in Alberta.

ANTHRAX. One case was reported in Ontario and 1 in Saskatchewan, with no deaths.

LEPROSY. There was 1 case reported in British Columbia, with no deaths.

PSITTACOSIS. There was 1 case reported in Ontario, with no deaths.

TRACHOMA. There was a further decrease in the incidence of this disease during 1942, with 40 cases reported, as compared with 50 cases in 1941, and 157 cases in 1940. British Columbia reported 28 cases, Manitoba 7, Saskatchewan 3, and Alberta and Ontario 1 each.

VIOLENT DEATHS

In 1942 there were 8,127 violent deaths with a death rate of 69.8 as compared with 8,442 deaths and a death rate of 73.5 in 1941, 7,418 deaths and a rate of 65.2 in 1940, and the five-year averages of 7,323 deaths and 65.4 rate for 1936 to 1940. British Columbia had the highest rate, 105.5, Ontario was second, with 79.9, while Quebec was lowest with 54.3.

ACCIDENTAL DEATHS. There were 7,181 accidental deaths in 1942, with a rate of 61.7 as compared with 7,416 deaths and a death rate of 64.5 in 1941, 6,322 deaths and a death rate of 55.6 in 1940. The average death rate for the five years 1936 to 1940 was 55.7.

Included in the accidental deaths were 1,387 due to automobile accidents, which gives a death rate of 11.9. The number of deaths in 1941 was 1,852 with a death rate of 16.1, and in 1940 there were 1,723 deaths with a death rate of 15.2. The average death rate for the five years 1936 to 1940 was 13.9. Ontario had the highest rate, 15.9, British Columbia was second with 13.9, and Saskatchewan was lowest with 6.3. The restrictions on the use of automobiles caused by gasoline shortages would appear to have had a definite effect upon the death toll from motor traffic, which for a number of years prior to 1942 had been rising by alarming proportions.

SUICIDES. There was a further reduction in the number of suicides in 1942 when the number was 835 as compared with 896 in 1941, and 948 in 1940. The death rate in 1942 was 7.2; in 1941, 7.8; in 1940, 8.3, with an average death rate for 1936 to 1940 of 8.5. British Columbia had the highest death rate, 12.6, Alberta was second with 10.4, and Prince Edward Island was lowest with 3.1.

A Cheese-Borne Epidemic of Typhoid Fever

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THE County of Champlain is on the northern shore of the St. Lawrence River, between Quebec and Montreal. It may be considered the geographical centre of the Province. Its county town, Cap de la Madeleine, is the half-way mark on the road from Quebec to Montreal. Bounded to the south by the St. Lawrence river, the county stretches for a distance of twenty-seven miles from the City of Trois-Rivières and the St. Maurice river, which form the western boundary, to the limit-line of the County of Portneuf in the east, and northwards for a distance varying from eighteen to twenty-five miles up to the County of Laviolette. The population in 1941 was 29,338.

During the fall of 1941, three neighbouring municipalities of the eastern part of the county experienced an epidemic of typhoid fever which began in Batiscan, a village of 1,231 population, located eighteen miles east of Trois-Rivières (see figure I). The other municipalities attacked were La Pérade, population 2,477, five miles east of Batiscan, and Ste. Geneviève, population 1,590, four miles north-west of Batiscan. From September 1st to 30th, 34 cases of typhoid fever were reported from these localities. In addition 6 cases associated with this outbreak occurred in Montreal and Boucherville. A total of 40 cases was thus registered, with 6 deaths—a mortality rate of 15 per cent. Table I presents the cases by date of onset.

The Batiscan Epidemic

On September 18, 1941, we first learned of the existence of two cases of typhoid fever in the Municipality of Batiscan, through the reports of the Provincial Laboratory. Both cases were investigated on the same day.

The first patient, L.L., had worked at the cheese and butter factory R. at Batiscan until July 1st, and later at the butter factory S.C. in the same locality from July 1st to September 10th. This young man felt the first symptoms of the disease on or about September 1st, but kept on working until the 10th of the month.

The second case, C.M.P.E., also reported on September 18th, knew definitely the date of onset of his illness, September 1st. The two cases were thus concurrent. During the epidemiological investigation of C.M.P.E., it was learned that his father, C.M.C.E. (case no. 13), and four members

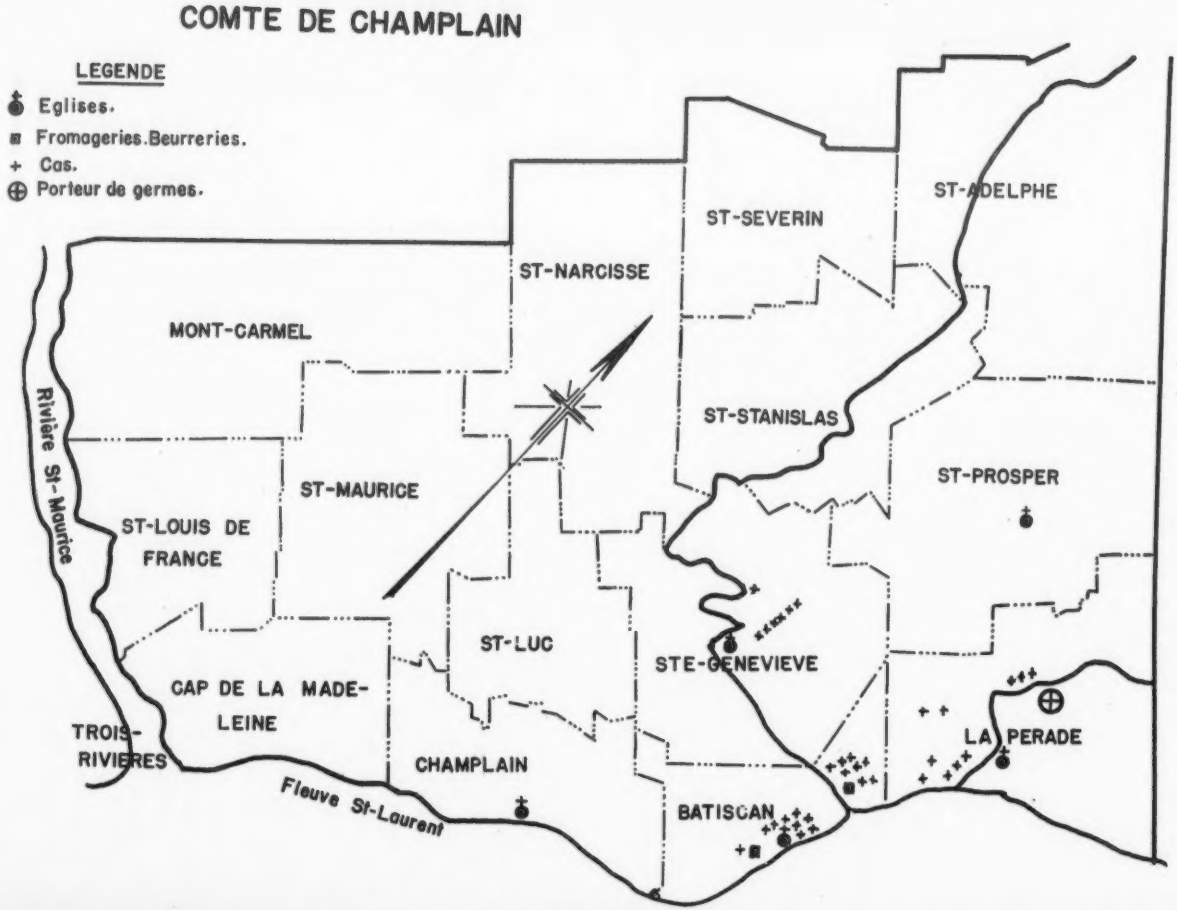
COMTE DE CHAMPLAIN
LEGENDE
Eglises.
Fromageries.Beurreries.
Cas.
Porteur de germes.
ST-SEVERIN
ST-ADELPHE
ST-NARCISSE
MONT-CARMEL
Rivière St-Maurice
ST-STANISLAS
ST-PROSPER
ST-MAURICE
ST-LOUIS DE FRANCE
ST-LUC
STE-GENEVIEVE
CAP DE LA MADELEINE
TROIS-RIVIERES
CHAMPLAIN
LA PERADE
Fleuve St-Laurent
BATISCAN

FIGURE I

of a neighbouring family (cases 4, 7, 8 and 9), were sick and they were visited without delay. A diagnosis of typhoid fever was made and the family doctor was advised of the diagnosis and instructed to notify the families concerned. It is to be noted that the first patient, L.L., had a medical consultation only twelve days after the onset of the disease, while C.M.P.E. waited for nine days before calling a physician.

TABLE I

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC
SEPTEMBER, 1941

CASES BY DATE OF ONSET

Case No.	Initials	Age	Sex	Deaths	Onset	Municipality
1	L.L.	21	M		1	Batiscan
2	C.M.P.E.	20	M		1	Batiscan
3	L.J.G.	8	M		6	La Pérade
4	C.L.	23	M		9	Batiscan
5	B.M.	18	F	x	9	Montreal
6	D.D.V.	27	F		10	Montreal
7	C.C.	30	M		11	Batiscan
8	C.J.	64	M		12	Batiscan
9	C.D.C.	22	F		12	Batiscan
10	B.G.	11	M	x	12	Ste. Geneviève
11	B.R.	16	F		12	Ste. Geneviève
12	C.H.	44	M	x	14	Batiscan
13	C.M.C.E.	47	M		14	Batiscan
14	B.T.	17	F		14	Montreal
15	R.G.	22	F		15	Ste. Geneviève
16	C.P.	12	M		16	Batiscan
17	C.R.	19	M		16	Batiscan
18	C.J.	6	M		16	Batiscan
19	B.L.	14	F		16	Ste. Geneviève
20	L.C.	27	M	x	17	La Pérade
21	S.-O.D.	17	M		18	Batiscan
22	C.M.	24	M		18	Batiscan
23	B.P.	17	M		19	Batiscan
24	L.G.	22	F		19	La Pérade
25	L.D.A.	35	F		19	La Pérade
26	L.J.	27	M		19	La Pérade
27	C.J.A.	4	M		20	Batiscan
28	B.T.	34	F		20	Ste. Geneviève
29	B.P.	17	M		21	Ste. Geneviève
30	N.B.	22	M		22	Batiscan
31	L.J.	7	M		24	La Pérade
32	M.M.	13	M		24	La Pérade
33	H.A.	31	M		25	La Pérade
34	L.M.C.	25	F	x	25	Batiscan
35	L.Y.	18	F		25	Montreal
36	H.Y.	30	F		25	Boucherville
37	G.A.	46	M	x	26	Boucherville
38	B.D.A.	57	F		27	Ste. Geneviève
39	L.A.	41	M		28	La Pérade
40	M.A.	18	M		30	La Pérade

Of these 7 cases of typhoid fever, 6 cases (2, 4, 7, 8, 9 and 13) were living in an area in which a private syndicate supplied water to 19 families, as well as to the R. cheese and butter factory. The other case (case 1) worked in the same area. The water system was poor; both the intake and the watershed were not satisfactory, and although improvements had been requested, nothing had been done. It was obvious that this water supply might be

FIGURE I

TABLE II

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941
SUMMARY OF CASES AT BATISCAN

Cases	Age	Sex	Date of onset (1)	Lab.	Type	Water (2)	Milk	Butter (3)	Cheese (3)	Butcher	Grocer	Baker
LL.	21	M	1	F.+	D1	S	Labis-sonnière	R	R	Baril, Léveillé	St. Cyr, Bailly Marquin	Lachance, Germain, Trottier
C.M.P.E.	20	M	1	F.+	D1	S	Farm	R	R	Croteau, Léveillé	Arcand, Roy	Croteau, Léveillé
C.L.	23	M	9	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.C.	30	M	11	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.J.	64	M	12	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.D.C.	22	F	12	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.M.C.E.	47	M	14	F.+	D1	S	Farm	R	R	Croteau, Léveillé	Arcand, Roy	Frigon, Lachance

(1)—September, 1941. (2)—Private company owner of water system. (3) "R"—Initial of owner of cheese and butter factory.

the cause of the epidemic. Every patient used it, including L.L. on his visits twice a week to the R. cheese and butter factory where he drank water many times. All the cases could be explained very easily—perhaps too easily not to leave doubt as to the cause of the epidemic.

Summary of Cases

Data concerning the age, sex, date of onset, etc., of the 7 cases at Batiscan are presented in table II. The ages ranged from 20 to 64 years, with four persons in the 20-24 age-group. Six cases were in males. All the cases had the onset of their disease in the first fortnight of September: 2 in the first week, 4 in the second, and the seventh case on the first day of the third week. Laboratory specimens were submitted for each patient and *Bact. typhosum* was isolated from the faeces. An attempt was made to type these strains by the method of Craigie and Yen, but the strains were found to be resistant to all the phage preparations available at that time. Each patient had drunk water supplied by the private syndicate, and all but one consumed milk and cream from his own farm. Butter, cheese, meat, groceries and bread were supplied by the few local dealers. There was no new nor old case of typhoid fever in these dealers' homes and the only common vehicle of infection appeared to be water.

Extension of the Outbreak

A few days later, inoculation against typhoid fever was offered to the 19 families supplied with water by the syndicate. On the day of the first injection, September 22nd, it was learned that there were doubtful cases in the Village of Batiscan. These new cases were visited without delay. Five new cases (nos. 12, 17, 18, 22 and 23), with 4 in one family, now had to be accounted for. Our theory of water-borne infection could no longer be substantiated, as the village is supplied by another system and these new patients had not drunk water provided by the syndicate. We had, therefore, to look elsewhere for the real cause of the epidemic.

Case histories were taken as soon as possible. It was established that each of the 12 known cases had eaten dairy products from the R. butter and cheese factory, on September 22nd. Both these foods could be incriminated as they were the only common foodstuffs. The butter, although made from pasteurized cream, had been churned in doubtful water supplied by the syndicate. The cheese, of the cheddar type, had been made from raw milk and consumed in the green stage, some ten days after manufacture. As the infection was spreading, vaccination was offered to the population of Batiscan, while a serious investigation progressed at the R. factory. The plant was rather filthy and foul with flies. On September 25th the owner was ordered to cease the sale of butter and cheese; the products were impounded in a special warehouse, and the establishment was cleaned and disinfected under the supervision of our engineer and our sanitary inspector. The owner and the employees were questioned very carefully, but in none of them could a history of previous typhoid be suspected. Nevertheless, samples of faeces

and urine were taken. The findings are presented in table III. The 6 persons submitted 20 samples, all of which were negative.

TABLE III

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941

LABORATORY EXAMINATION OF SPECIMENS FROM EMPLOYEES OF THE R FACTORY AT BATISCAN

Employee	No. of samples	Results
Owner	2	Negative
Cheese-maker	5*	Negative
First helper	3	Negative
Second helper	3	Negative
Third helper	4	Negative
Fourth helper	3	Negative

*Administration of cholagogue.

Epidemiological Findings

A little later, new cases were detected in or reported from Batiscan, Ste. Geneviève, La Pérade, and even Montreal. A detailed epidemiological investigation of each of the 40 cases was made.

The map of the County of Champlain (figure I) shows the geographical distribution of cases occurring in the territory served by the County Health Unit. In Batiscan, focus of the epidemic, there were 17 cases; in La Pérade, 10; and in Ste. Geneviève, 7. To this total of 34 cases must be added 6 extra-territorial cases—4 in Montreal and 2 in Boucherville. The presence of a known typhoid carrier in La Pérade is also indicated on the map.

Distribution of Cases according to Date of Onset

The distribution of cases according to date of onset is presented in figure II. The epidemic curve of this bar diagram climbs rapidly to a peak during

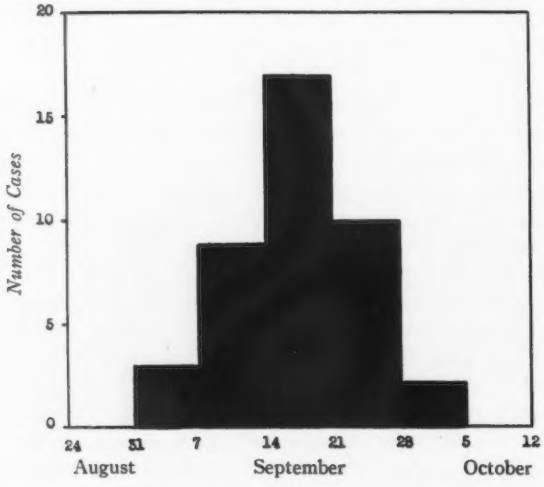

FIGURE II

DISTRIBUTION OF CASES BY DATE OF ONSET

the week of September 14th and falls back to the abscissae in the same period of time, indicating a massive and well-limited infection.

As the investigation had not brought to light any abnormal number of dysentery cases, the premonitory sign of a water-borne typhoid outbreak, nor any secondary cases covering a period of weeks, our research was directed towards a food infection.

Age and Sex Distribution of Cases

The age distribution of the 40 cases (table IV) is very interesting. There was only one case in the age-group 0-4 years, and 3 in the age-group 5-9 years. Thirteen cases (one-third of the total number) occurred in the group 10-19 years, and 12 cases (30 per cent) in the group 20-29 years. Thus nearly two-thirds of the cases were in these two groups. In the group 30-39 years there were 5 cases (12.5 per cent) and in the group 40-49 years, 4 cases (10 per cent). Only 2 cases (5 per cent) were over 50 years of age. As to sex, 65 per cent of the cases were in males and 35 per cent were in females. The 10-29 age-group suffered a heavier attack, as is often the case in water-borne contamination or in an infection caused by a food other than milk. The only case in the infants' group disproved a theory of milk-borne infection. On the other hand, the rather high proportion of cases (27.5 per cent) occurring in those over 30 years of age would be abnormal in a water-borne infection, and in the latter the cases would be more evenly distributed by sex.

TABLE IV

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941

DISTRIBUTION OF CASES BY AGE AND SEX

Age-groups	Cases	Percentage	Male	Female
0 - 4	1	2.5	1	0
5 - 9	3	7.5	3	0
10 - 19	13	32.5	8	5
20 - 29	12	30.0	7	5
30 - 39	5	12.5	2	3
40 - 49	4	10.0	4	0
50 and over	2	5.0	1	1
All ages	40	100.0	26 (65.%)	14 (35.%)

Laboratory Confirmation of Cases

All the cases were confirmed by the laboratory. *Bact. typhosum* was isolated in 36 cases through cultures from faeces and in 4 cases from blood culture. Among the latter persons, all living outside the county, there were 2 deaths. As in each case *Bact. typhosum* was isolated, a special study of positive serum agglutinations was not included, since it is not possible to interpret such findings without full clinical information relating to each case.

The distribution of deaths by age and sex is presented in table V. A high fatality of 15 per cent was experienced in this outbreak, indicating a heavy systemic infection. One of the patients, L.M.C. (case no. 34), presents a

history worthy of mention. This girl had received three doses of typhoid-paratyphoid B vaccine of $\frac{1}{4}$, $\frac{1}{2}$ and 1 cc. during February, 1941, six months before the beginning of the epidemic. It is reasonable to assume that she had developed a good immunity before the epidemic, so that a massive infection was necessary to cause a severe form of the disease resulting in death.

TABLE V

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941

DISTRIBUTION OF DEATHS BY AGE AND SEX

No.	Case	Age	Male	Female
5	B.M.	18		x
10	B.G.	11	x	
13	C.H.	44	x	
20	L.C.	27	x	
34	L.M.C.	25		x
37	G.A.	46	x	
	6 deaths		4	2

History of Vaccination

Of the 40 cases, 8 had received T.B. vaccine, 4 just before the first cases appeared and 4 at the beginning of the outbreak (table VI). One patient had been vaccinated in 1932 and 2 in 1934, in addition to case no. 34, previously mentioned. The disease was mild in 2 cases, severe in 5, and fatal in 1. It is not felt that the vaccine had any influence on the course of the disease, whether the patients had been previously vaccinated or had received the vaccine just at the onset of their illness.

In the population of 1,000 families exposed to the infection, only 15 were attacked. This familial attack rate of 1.5 per cent establishes a well-localized infection. However, in the families attacked, the number of patients is important, another indication of a virulent method of infection. Of the 15 families, 8 had 1 case each and 7 had a total of 32 cases—an average of 4.6 patients per family. One family had 2 cases, two families 3 cases, one family 5 cases, two families 6 cases, and one family 7 cases.

TABLE VI

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941

HISTORY OF VACCINATION OF CASES

No.	Case	Date of inoculation	Doses	Onset September	Severity of disease
14	B.T.	Sept. 17, 1941	1	14	Severe
24	L.G.	1934	3	14	Severe
25	D.L.A.	Sept. 25, 1941	1	19	Severe
32	M.M.	1934	3	24	Mild
33	H.A.	1932	3	25	Mild
34	L.M.C.	February, 1941	3	25	Fatal
35	L.Y.	Sept. 17-24, 1941	2	25	Severe
39	L.A.	Sept. 25, 1941	1	28	Severe

Distribution of Cases according to Water Supply

The private syndicate at Batiscan supplied 9 cases with water analyzed as bad. Eight cases were served by the public system at Batiscan, 7 at Ste. Geneviève, 6 at La Pérade, and 4 in Montreal. Bacteriological examination of samples of water from these different water-works was favourable. Two cases were supplied by the water system of Boucherville, and 4 cases by water from two wells; analyses of all three were bad. The cases were therefore supplied from eight different sources, and 25 of them had drunk only safe water. Water then had to be excluded as the possible cause of the epidemic.

Milk and Cream Supplies

Twenty-six cases used milk and cream exclusively from their own farms, which numbered 10. The other 14 cases were supplied by 7 different distributors. Among these 14 cases were 6 who drank pasteurized milk only. Milk and cream were distributed by 17 different dealers. Two of these distributors had 4 cases each among their customers, one had 2 cases, and four had 1 case each. The epidemic therefore could not be traced to milk and cream supplies.

Butter Supply

Sixty per cent of the cases, or 24, used butter sold by the R. factory, and the other 16 were served by five different dealers. The distribution of the cases was as follows: Manufacturer R., 24 cases; S.C., 1 case; P., 2 cases; C.S.C., 4 cases; J., 7 cases; and V., 2 cases.

Of these six butter-makers, all of whom manufactured a pasteurized product, only one, R., could be suspected, as 24 of the patients were customers of his. It was established, however, that up to the 26th of August the butter sold by the R. factory had been made in the S.C. factory at Batiscan, but wrapped in an R. paper label. Before this date, the R. factory had produced cheese only. The butter was salted, pasteurized, and sold only a few days after manufacture. There was no doubt that another source of contamination was yet to be found in the R. plant to explain the large number of cases among its customers. As it was established that 15 patients had not even tasted this butter and that only one case might be attributed to its consumption when sold under label S.C., it was obvious that the same butter in label R. was not responsible for the epidemic.

Meat Supplies

Six butchers supplied the meat used by 37 cases, while 3 patients used products from their own farms. No new nor old case of typhoid fever could be traced to the butchers' families. In any event, one could not conceive that six butchers, living in five different municipalities, could at the same time be the cause of typhoid outbreaks among their respective patrons. Butcher M., of La Pérade, who had the largest number of cases (14) among his customers, served only a third of the cases. Butcher shops could therefore not be considered the agents of propagation of this epidemic.

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Groceries

Of the fifteen grocers, one could be credited with 12 cases, one with 10, one with 9, and one with 7. Again, no common factor of contamination could be found.

Bread Supplies

Of the eight bakeries, one was associated with 17 cases, two with 6 cases each, one with 4 cases, two with 2 cases, and two with 1 case each. Nine patients bought bread from more than one baker. Ten cases were in families that baked their own bread.

Patient L.A. (case no. 39) was a delivery man for the L. bakery, whose products were consumed by 17 patients. There was a previous case in the same family, D.L.A. (no. 25), whose date of onset was September 19th. Three days later, delivery-man L.A. stopped work at our request. He developed typhoid fever six days later. He had therefore to be accounted a victim, and not a cause, of the epidemic.

Pastries bought in restaurants were made by large bakeries. Their methods of manufacture were sanitary, their products were sold in the entire eastern section of the province, and they were of good quality. The principal distributor, V. of Ste. Marie, Beauce County, was the object of a special investigation by one of the authors during the months of August and September. No case of enteric fever among the customers of V. could be traced to the use of his pastries.

The other two dealers, Va. and B., both of Quebec, also had sanitary bakeries. Of the patients, only 8 used pastries manufactured outside their homes. Thus the outbreak was not attributable to bread and pastries.

Ice Cream, Sea Foods, and Restaurants

There was no use of ice cream in 13 instances. Five patients ate the product of an unknown manufacturer in different localities. The remaining 22 cases consumed ice cream manufactured by three large and reliable firms, which marketed a pasteurized product in many cities and numerous counties. No case of typhoid could be traced to this food beyond the limits of the three municipalities attacked.

Oysters and other sea foods were not consumed by even one patient. Only 8 patients ate occasionally in restaurants. No history of typhoid could be found in the families of the owners of the restaurants.

Cheese Supply

Each of the 40 patients had eaten cheddar-type cheese manufactured by the R. factory. The products of C. and K. in addition to cheese supplied by R. were consumed in one family with 4 cases; and cheese made by T. was used, along with the cheddar-type supplied by R., by two families in which 1 case each occurred. The three brands, C., K., and T., were pasteurized cheese. The Canadian cheddar-type cheese, made by R., was the only food common to all the patients.

The epidemiological history of Doctor B.'s family, from Montreal, established positively that cheese was the vehicle of infection. On September 1st this physician made a short trip to Ste. Geneviève, and before returning to the metropolis bought fifteen pounds of the R. cheese. We do not know exactly how many people had eaten cheese from this portion, but 7 persons developed typhoid fever: B.M. (case no. 5), B.T. (no. 14), L.Y. (no. 35), D.D.V. (no. 6), G.E. (no. 37), and H.Y. (no. 36), all living in Montreal or Boucherville; and R.G. (no. 15) of Ste. Geneviève. Two of these died. Case no. 15, R.G., a niece of the doctor, accompanied her uncle to Montreal, remaining there from September 1st to 13th. There she ate a small portion of the cheese. Two days after her return home, she came down with typhoid fever.

There can be no doubt that the cheese produced by R. in the latter part of August and the beginning of September was contaminated; but how could this contamination be explained? Should it be attributed to a typhoid carrier working in the cheese factory? to the water system supplying the plant? or to polluted milk used in the manufacture of the cheese?

But it has already been related that typhoid bacilli could not be isolated from samples of faeces submitted by the employees of the cheese factory. None gave even a doubtful history of typhoid fever. For these reasons, it was not possible to prove the presence of a typhoid carrier in the R. plant.

The water of the plant comes from a badly protected supply. Contamination of this water with *Bact. typhosum* would, of course, be possible, but there was not a single case of typhoid fever on the watershed. Moreover, if contamination had occurred, there would have been at least one case among the 14 families who used this water, as 9 cases developed in the 5 other families who used the same water and also had eaten cheese from the R. factory. On the other hand, the equipment of the factory was sterilized with steam and there was no addition of water to the milk during the process of cheese-making. Finally, even if this water had been contaminated with *Bact. typhosum*, it could not have been the source of infection for the patients living in the other localities.

The milk used in the manufacture of cheese could easily have been infected by a typhoid carrier or by a patient. The milk used in the R. factory was produced on 80 farms, 39 at Batiscan and 41 at La Pérade. There was no history of typhoid amongst these people, with the exception of a known carrier, who had received proper instructions concerning her condition and her duties. While investigating the case of L.J.G. (no. 3), son of a milk producer for the R. plant, we learned from his mother that two other children of the family, Ce. and Ct., had suffered from a disease of doubtful aetiology during August, 1941. L.J.G.'s attack of typhoid fever had been rather mild; he was feverish for two or three days and his may be termed an ambulatory case. His brothers, Ce. and Ct., had had the same form of disease. The elder one, Ct., was assigned to the milking of the cows and resumed this work after recovery from a few days' illness.

Eight specimens of faeces from Ce., taken between October 11 and No-

vember 14, 1941, proved negative, as did five specimens from Ct., taken during the period from October 10th to November 17th.

In spite of these negative results, the possibility of typhoid fever in these children could not be excluded, as more than two months had elapsed since the onset of their disease. Samples of blood were taken for sero-agglutination by different antigens. The results are presented in table VII.

Analysis of the blood sample submitted by Ce. might indicate that he was a typhoid carrier even if he had not had the clinical form of the disease. However, he was never vaccinated and eight specimens of faeces were negative. Ct. received two doses of typhoid vaccine, ¼ cc. at the end of September and ½ cc. at the beginning of October. This explains the presence of agglutinins in a high dilution. On November 3rd a bacteriological report on a sample of faeces of Ct. indicated the presence of *B. dysenteriae, newcastle* type, though there was no clinical evidence of recent dysentery.

Could this be the explanation of the doubtful disease in the L. family during the month of August? It must be admitted that the investigation in connection with this family had not been successful. They could not be accused of being the cause of the epidemic, but a contrary theory could not be disproved.

TABLE VII

BLOOD SPECIMENS FROM CHILDREN "L."

Initials	Antigens	Dilution	Results
Ce.	Typhosum O	1/50	Slightly positive
	Typhosum H	1/75	Slightly positive
	Typhosum Vi	1/25	Slightly positive
Ct.	Typhosum O	1/375	Strongly positive
	Typhosum H	1/375	Strongly positive
	Typhosum Vi	1/50	Strongly positive
	B. Paratyphosum B.	1/375	Strongly positive
	B. Dysenter. Newcastle	....	Positive

Laboratory Investigation

A large number of faeces, 443, from the patients and from the doubtful cases was sent to the Provincial Laboratory for investigation. From these, 161 cultures of *Bact. typhosum* were obtained, all of which proved to be resistant to a new series of phage preparations supplied by Dr. J. Craigie. This new series of phages for the typing of *Bact. typhosum* is prepared in accordance with the schema proposed by Craigie (1) in which Vi forms are subdivided in α, β, and γ groups. The α group includes the stable, and therefore epidemiologically significant, types which are fully susceptible to type II phage. The β group comprises partially resistant types of uncertain identity. The α group includes type D_1 and those phage resistant forms formerly designated as "imperfect V forms". Many of these owe their resistance to the fact that they carry a phage of low and limited lytic activity (2).

It was not possible to investigate the 6 cases living in Montreal and Boucherville as regards the type of *Bact. typhosum* causing their infections. Cultures isolated from 30 of the other 34 patients were investigated by Dr. Craigie, who identified them as type D_1 by phage typing and also demonstrated

in all the presence of symbiotic phage characteristic of this type and some other γ types (2). All the cultures isolated from the same person were of the same type. The 4 patients for whom the typing could not be made belonged to families in which there were multiple cases and the cultures isolated from these other familial cases were all typed as D_1.

Period of Incubation

To establish the most probable period of incubation during this epidemic, 4 cases had to be studied more intensively. Of these, 3 lived in Montreal and became ill after the consumption of a portion of the cheese bought by Dr. B. on September 1, 1941.

First Case, B.M. (no. 5). The earliest date on which this person could have eaten the contaminated cheese was September 1st, and the first symptoms of the disease appeared on September 9th. Incubation period: 8 days.

Second case, D.D.V. (no. 6). This lady did not eat cheese before September 1st and the onset of the disease was placed at the 10th of the same month. Incubation period: 9 days.

Third case, B.T. (no. 14). This young girl may have consumed the contaminated food from the first day of September, and the disease began on September 14th. Incubation period: 13 days.

Fourth case, C.L. (no. 4). The history of this case is more conclusive, because cheese had been consumed only once. On Labour Day this young man went to Batiscan to pay a visit to his parents and there he ate a piece of cheese. On September 9th he felt the first symptoms of his illness. Incubation period: 8 days.

One can gather from these histories that the minimum incubation period of the disease was 8 days. On the other hand, it is impossible to state the maximum period, as the patients ate cheese on many different days. These four cases are the only ones in which the date of consumption of the product could be established; however, the histories of the other patients lead us to believe that the incubation period was rather short and may be placed at from 8 to 10 days.

It is not easy to give the number of primary and secondary cases in the 40 registered patients, because the majority of them had eaten repeatedly of the contaminated food. Should one conclude that we had to deal with 40 primary cases? It is to be expected that, with such a high number of cases, secondary infection is apt to occur, in spite of extensive control measures. However, after a careful review of the cases, it is not possible to mention a single person who was infected directly or indirectly by a patient, a fact which may be considered unusual. As proof cannot be established, we shall not attempt a classification.

Causative Germ Carrier

Contamination of the cheese cannot be explained by polluted water, or by milk infected by a patient, the L. incident being excluded. What about germ carriers? Our investigation was directed towards the only known typhoid carrier of the region, Mrs. C. A., of La Pérade. The latter submitted two

specimens of faeces, with positive results. The isolated cultures gave the following reactions on typing:

First sample, November 3, 1941: "Culture cannot be typed."

Second sample, December 2, 1941: "This culture of *Bact. typhosum* gives the same reactions as the cultures isolated in the Batiscan epidemic."

This typhoid carrier was questioned very carefully. She admitted that during the latter weeks of August she had milked cows, against our orders, and that the milk was sold to the R. cheese factory. A logical chain of arguments led us to this carrier as the causative agent of the epidemic. Mrs. C. A. had had typhoid fever twenty years before in Deschambault and since that time she may well have been the cause of small outbreaks at La Pérade, namely in 1931, 1932, and 1934. In the future, it will be easier to trace a new occurrence as typing for *Bact. typhosum* is now done as a routine at the Provincial Laboratory of the Ministry.

METHODS OF CONTROL

In the control of this outbreak, the following measures were taken:

1. Isolation of patients and disinfection of excreta.
2. Early vaccination of familial contacts.
3. Appointment of a person not connected with the family to handle the milk when a case occurred in a producer's home.
4. Early and thorough epidemiological investigation, the contaminated food being known five days after notification of the first two cases.
5. Rigorous disinfection of the cheese factory and prohibition of the sale of cheese and butter produced therein.
6. Storage of the contaminated cheese in a warehouse for a minimum period of six months.
7. Detection of doubtful cases by physicians and staff of the Health Unit.
8. A large number of specimens of faeces and urine sent to the laboratory for confirmation of diagnosis, *Bact. typhosum* being isolated in each of 40 cases.
9. General vaccination in the attacked municipalities, with the following results:

Municipality	Population	Population Vaccinated	Percentage Protected
La Pérade	2,477	1,617	65.2
Ste. Geneviève	1,590	720	45.2
Batiscan	1,231	843	68.4
Total	5,298	3,108	60.0

10. Each patient released after two negative faeces specimens submitted with an interval of one week.
11. A closer control over the known typhoid carrier.
12. Final shut-down of the R. factory on October 25, 1941.

As a result of this study, three important measures were recommended in the Province:

1. Early notification of each case of enteric fever.
2. General check-up of typhoid carriers.
3. Pasteurization of cheese, or at least the holding of the product for a three-month period of maturation before release for consumption.

REFERENCES

1. Craigie, J.: The Present Status of Phage Typing. Canad. Pub. Health J., 1942, *33*: 41.
2. Craigie, J.: Personal communication.

Preparation and Standardization of Johnin Purified Protein Derivative*

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JOHNIN is used for the early detection of Johne's disease, a chronic infection of cattle characterized by intermittent diarrhoea, progressive weakness, dehydration, emaciation and death. The causative organism, *Mycobacterium paratuberculosis* (Johne's bacillus), is a member of the acidfast group. Johne and Frothingham (1) demonstrated its presence in the thickened intestinal mucous membrane of an infected animal. Following discovery of the organism, attempts were made by Johne and others to cultivate it but for a time these were unsuccessful. Finally, Twort and Ingram (2) succeeded, using an egg medium to which was added *M. tuberculosis* killed by heat and suspended in glycerin saline solution. This supplied an "essential substance". Other acidfast organisms and their extracts have been added also and found to possess the essential growth factor. *M. phlei*, or an extract of it, is now preferred by the majority of workers.

A study of the culture medium requirements and the conditions of growth of *M. paratuberculosis* was reported by Watson (3), who described methods of adaptation of the organism to grow on Long's synthetic medium without addition of the essential substance. All johnin referred to in this paper resulted from the propagation of *M. paratuberculosis* in this manner.

The technique first employed was similar to that used in the production of old tuberculin. The resultant product, however, differed from old tuberculin in that it contained non-specific substances which gave rise to reactions in some normal animals. If dilutions were made sufficiently high to avoid these reactions, the johnin became unreliable for diagnostic use. Therefore, an attempt was made to remove the factors responsible for non-specific reactions while retaining the specific substance. After several methods had been tried, that developed by Seibert (4) for the production of the Purified Protein Derivative of tuberculin was adopted.

PREPARATION OF JOHNIN PURIFIED PROTEIN DERIVATIVE (P.P.D.)

Medium and Methods Employed

Strains of *M. paratuberculosis* which had been adapted to grow without addition of the essential substance were seeded on Long's synthetic medium, adjusted to pH 5.6-5.8, which is the optimum range of growth of *M. para-*

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tuberculosis on this medium. This pH is obtained by using less sodium carbonate than the original formula requires.

Four lots of Purified Protein Derivative were produced according to the method of Seibert (4), using mature cultures having a pH range of 5.3 to 5.8. The average yield was 0.049 gm. per liter of original volume (Table I). Two bottles containing liquid cultures of *M. paratuberculosis* propagated in the manner described were forwarded to Esmond R. Long. He reported yields of Purified Protein Derivative of 0.0809 and 0.0478 gm. respectively per liter of original volume. These yields were small compared with those of tuberculin P.P.D. and Dr. Long suggested that as the pH of the culture, when harvested, lies between 5.3 and 5.8, "It is quite possible that at this pH the protein is precipitated and remains adherent to the bacillus."* The method of preparation was therefore modified and is described below.

After the cultures have been grown a sufficient length of time, they are collected in one or more large pyrex bottles. By the addition of sodium hydroxide the pH is altered to approximately 8.0. The bottles are placed in the refrigerator for eight or ten days during which time the contents are agitated frequently. Then the material is heated to 100°C. for three hours. The bacilli are removed by filtration through paper and Mandler filters. The filtrate is concentrated over a water bath to one-fifth of its original volume. To the concentrate is added an equal volume of 1 per cent carbolized distilled water. The mixture is refrigerated for several days and again passed through a Mandler filter to remove sediment which may have formed. After further dilution with 0.5 per cent carbolized water, it is ready for ultrafiltration.

More recently a further modification was made as a result of an article by Seibert and Glenn (5) in which they recommended the use of a buffered diluent, ultrafiltration under refrigeration, repeated precipitation with ammonium sulphate and, finally, drying from the frozen state (lyophylizing). One lot of Purified Protein Derivative was prepared according to this method and a second lot was similarly processed except that the final precipitation was made with trichloracetic acid.

Apparatus

The apparatus employed for the production of johnin P.P.D. is similar to that described by Seibert (6) for the preparation of tuberculin P.P.D. except for a modification in the technique used for coating the shells. It was found that numerous small bubbles developed in the membranes of many of the shells that were coated with gun-cotton solution while still wet. This defect was eliminated when the shells were dried before dipping.

Yields

A table is given below which refers to averages of four lots of johnin harvested at the pH of fully developed cultures and of seven lots in which this pH was changed to the alkaline range.

**Private communication.*

TABLE I

ALKALINE ADJUSTMENT OF MATURE JOHNE'S BACILLUS CULTURES AND ITS INFLUENCE ON THE YIELD OF JOHNIN P.P.D.

Total No. of Lots	Approximate pH	Averages			
		Original Volume Liters	Incubation Period Weeks	Yield per Liter dry wt.	
				Bacilli	P.P.D.
				Gm.	Gm.
4	5.5 (not adjusted).....	7.24	27	8.33	0.049
7	8.0 (adjusted).....	15.45	35	*8.53	0.250

*Average of 4 lots only; bacilli from 3 lots used in another experiment.

The results tabulated above, together with those of other trials not recorded here, indicate that the supposition of Long was correct. Where the pH is adjusted to alkalinity the yield of P.P.D. is always increased considerably.

THE STANDARDIZATION OF JOHNIN P.P.D.

Accuracy has been attained in the titration of tuberculin by the intradermal test-method using sensitized guinea pigs (7 and 8). The similar use of laboratory animals for the standardization of johnin was considered of little value, because they proved resistant to *M. paratuberculosis*. Therefore, the biological assay of johnin was conducted on naturally or artificially infected cattle. This method allows only a rough estimation of potency due to the fluctuation of allergy in naturally infected cattle (9) and to the short duration of pronounced sensitization even when the animals are injected with large amounts of Johne's bacilli in mineral oil (10).

Although it was shown that a certain degree of sensitization is obtained in guinea pigs after intraperitoneal injection of massive doses of Johne's bacilli (11), and that such sensitivity may be enhanced by using paraffin oil for suspending the micro-organisms (12), no concerted attempt was made until recently to employ guinea pigs for the biological assay of johnin.

In 1941 Glover (13) reported a study in which guinea pigs, rendered allergic by the intraperitoneal injection of Johne's bacilli in mineral oil, were employed as test animals. On these, johnin was titrated intradermally. Johnson and Cox (14) proposed a standardization method using White Leghorn cockerels injected intraperitoneally with heavy suspensions of Johne's bacilli in mineral oil. The test was conducted on the wattle. In preliminary trials at this Institute (15) it was found that, when guinea pigs were injected with Johne's bacilli by various routes, those inoculated intraperitoneally usually became most highly sensitized. While the use of mineral oil as a vehicle considerably increased the sensitivity of these guinea pigs, it also caused a loss of condition among them, often detrimental to the reaction. In addition, many animals died.

Experiments were carried out using calcium salts. This procedure was introduced by van Deinse (16) for the easier demonstration of the filterable forms of tubercle bacilli. In adopting it for the sensitization of guinea pigs to johnin we are now using sterilized 5 per cent solutions of calcium

chloride ($CaCl_2$, $6H_2O$) and dibasic sodium phosphate (Na_2HPO_4, $12\ H_2O$), mixing them in a ratio of 1:4. The resultant precipitate is thrown down by centrifugation, the supernatant withdrawn and replaced by an equal volume of physiological saline. After vigorous shaking, 2.5 cc. of the calcium salt suspension, warmed to body temperature, is injected intraperitoneally into guinea pigs of 700 to 800 gm. weight. Forty-eight hours later 20 mg. of Johne's bacilli, suspended in physiological salt solution, is inoculated. A fairly high and even level of sensitivity is obtained between the 3rd and 7th week, at which time the biological assay of johnin is conducted.

One of the first lots of johnin P.P.D. produced and identified as No. XXIII proved to be highly active in sensitized guinea pigs and experimentally infected cattle. It had been used on a number of infected herds for several years and was sufficiently potent to elicit intradermal reactions in doses of 0.2 mg. with a regularity which permitted control of the disease by the elimination of reactors. This property of lot XXIII seemed to warrant its use as a "provisional standard".

Technique of Standardization

Standardization is brought about by comparing on the same sensitized guinea-pig reactions which follow the inoculation of an unknown johnin P.P.D. with those of the "provisional standard". The products are inoculated intradermally on corresponding lateral sites of the thorax and abdomen. The resultant reactions are similar to tuberculin reactions including hyperaemia, oedema, infiltration and necrosis. In our experience the area occupied by the oedematous swelling is a reliable and constant basis for comparison. This is measured at the 48th hour, when the reaction is generally most pronounced. Taking an average of two diameter readings, the area is calculated in sq. mm. by the usual formula.

The standardization is carried out in three stages:

(*a*) The preliminary test.
(*b*) The main test.
(*c*) The final or confirmatory test.

Preliminary Test: In this test two groups of sensitized guinea pigs are used, each composed of three animals. Both groups receive the standard and the P.P.D. under test in identically graded doses on three corresponding opposite sites. The weight difference between each consecutive dose in the series is 50 per cent. (See Table II.)

The results of the preliminary test indicates the degree of sensitization of the guinea pigs and the approximate ratio of potency between the standard and unknown johnin P.P.D. Sensitization of the guinea pigs is regarded as satisfactory for the application of the main standardization test, if the smallest dose of the standard (0.003125 mg.) elicits an average area reaction of approximately 79 sq. mm. (10 mm. in diameter).

Main Test: The main test is then conducted on two groups of not less than 6 guinea pigs each. The standard is used on all guinea pigs in only

one strength, i.e. in a dose which in the preliminary test gave an area reaction of approximately 177 sq. mm. (15 mm. in diameter). This "selected standard dose" is injected on three sites on one side of each animal.

TABLE II

GRADED DOSES OF THE STANDARD AND UNKNOWN JOHNIN P.P.D. AS USED IN THE PRELIMINARY INTRADERMAL STANDARDIZATION TEST ON GUINEA PIGS.

Number Guinea Pigs	Standard P.P.D. Weight (mg.)	Solvent cc.	Site	Unknown P.P.D. Weight mg.	Solvent cc.	Site
3	0.10	0.1	Left	0.10	0.1	Right
	0.05	0.1		0.05	0.1	
	0.025	0.1	Side	0.025	0.1	Side
3	0.0125	0.1	Left	0.0125	0.1	Right
	0.00625	0.1		0.00625	0.1	
	0.003125	0.1	Side	0.003125	0.1	Side

On the other hand, the P.P.D. of unknown strength is applied in varying doses on opposite corresponding sites in the following manner: The first group of six guinea pigs receives three graded doses, of which the median or basic dose represents that amount of P.P.D. which in the preliminary test gave an area reaction of approximately 177 sq. mm. and therefore a similar reaction to that of the "selected standard dose". The second dose is made to contain twice the amount of P.P.D. of the basic dose, and the third dose one half of it.

In the second group of six guinea pigs the median or basic dose of the unknown P.P.D. remains the same. But the second and third dose are made to contain $1\frac{1}{3}$ times and $\frac{3}{4}$ times respectively the weight of the basic dose.

By grading the doses in this manner two series of the unknown P.P.D. are obtained: in the first the weight difference between each consecutive dose is 50 per cent, in the second it is narrowed down to 25 per cent.

In recording the results of the test, the average of all area reactions obtained from the three equal doses of the standard in each of the two groups of guinea pigs is computed and compared with the corresponding average reaction resulting from each graduated dose of the unknown. This usually establishes with certainty the ratio of potency between the standard and the unknown johnin P.P.D. within the limits of a 50 per cent variation in weight difference.

Final Test: Not less than six guinea pigs are used for this test. The johnin P.P.D. under examination is inoculated in one strength only, this being in a dose which, according to the results of the main test, should elicit an area-reaction approximating that of the "selected standard dose". Three injections of this weight of the unknown P.P.D. are given each animal while the "selected standard dose" is inoculated opposite on three corresponding sites. The average area computed from the sum of all reactions to the unknown P.P.D. is compared with a similarly obtained average of the "standard". Only if these two average areas bear close relationship is the standardization considered satisfactory.

Chart I summarizes the procedure.

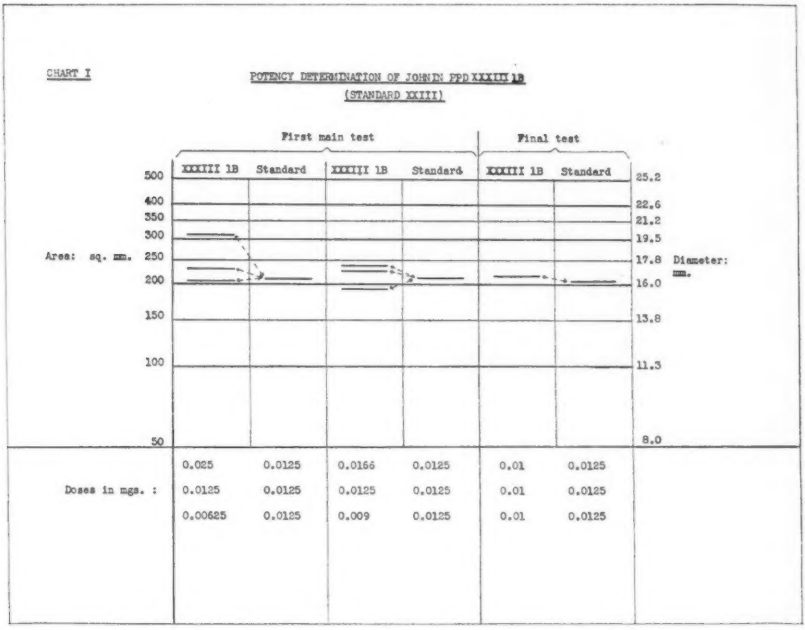

CHART I

POTENCY DETERMINATION OF JOHNIN P.P.D. XXXIII 1B
(STANDARD XXIII)

Results of the Standardization Tests

The potency of six johnin P.P.D. preparations standardized according to the method described, using lot XXIII as the standard, was as follows:

1 mg. of "Standard XXIII" equals:
1.50 mg. of Ser. No. XXVI A
2.00 mg. of Ser. No. XXX Lot I
3.00 mg. of Ser. No. XXXI
1.33 mg. of Ser. No. XXXII
0.66 mg. of Ser. No. XXXIII Lot IA*
0.80 mg. of Ser. No. XXXIII Lot IB*

*Prepared according to method of Seibert and Glenn (5).

Stability of Johnin P.P.D. Preparations

The potency of stock solutions of johnin P.P.D., corresponding to a concentration of 1:100 as well as of solutions of 1:500, stored at refrigerator temperature for 16 and 10 months respectively, was compared in guinea pig tests with freshly prepared solutions of the "standard".

No noticeable decline in strength was noted during these periods and it appears likely that under similar storage conditions the potency of johnin

P.P.D. in such concentrations will remain stable for considerably longer time.

SUMMARY

1. *M. paratuberculosis* adapted to grow on Long's synthetic medium was used in the preparation of johnin.

2. Preliminary lots of johnin were prepared by a technique similar to that used in the production of K.O.T. Substances which elicited non-specific reactions were found present. These substances were removed by ultrafiltration as described by Seibert for the production of tuberculin P.P.D.

3. The yield of johnin P.P.D. was found to be greater when the pH of the medium was changed from an acid to an alkaline reaction previous to harvesting.

4. A high and fairly constant degree of sensitization to johnin was obtained in guinea pigs by intraperitoneal injection of Ca-salts 48 hours prior to the application of the sensitizing dose of *M. paratuberculosis* by the same route.

5. Johnin P.P.D. preparations obtained by identical methods varied considerably in potency.

6. By biological assay on sensitized guinea pigs the variation in potency of different lots of johnin P.P.D. could be detected with a reasonable degree of accuracy.

REFERENCES

1. Johne and Frothingham: Deutsche Zeitschr. für Tiermed. & vergleich. Path., 1895, *21* : 438.
2. Twort, F. W. and Ingram, G. L. Y.: Proc. Royal Soc., B., 1912, *84*.
3. Watson, E. A.: Canad. Pub. Health J., 1935, *26* : 268.
4. Seibert, Florence B.: Am. Rev. Tuberc., 1934, *30* : 713.
5. Seibert, Florence B. and Glenn, John T.: Am. Rev. Tuberc., 1941, *44* : 9.
6. Seibert, Florence B.: J. Biol. Chem., 1928, *78* : 345.
7. Eagleton, A. J. and Baxter, E. M.: Brit. J. Exp. Path., 1923, *4* : 289.
8. Lewis, P. A. and Aronson, J. D.: Am. Rev. Tuberc., 1923, *7* : 404.
9. Minett, F. C.: J. Comp. Path. & Therap., 1935, *48* : 125.
10. Buxton, J. B. and Glover, R. E.: Agric. Res. Council, London, 1939, Rep. Series No. 4.
11. Boquet, A.: Ann. Inst. Pasteur, 1928, *42* : 495.
12. Hagan, W. A. and Zeissig, A.: J. Am. Vet. Med. Assoc., 1929 (N.S.), *27* : 985.
13. Glover, R. E.: Vet. J., 1941, *97* : 3 and 179.
14. Johnson, H. W. and Cox, B. F.: Am. J. Vet. Res., 1942, *3* : 131.
15. Konst, H. and Watson, E. A.: Am. J. Vet. Res., 1943, *4* : 34.
16. van Deinse, F.: Ann. Inst. Pasteur, 1931, *47* : 135.

The Antitoxin Response to Diphtheria Toxoid of Low Alum Content

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VARIOUS considerations enter into the selection and use of an alum-precipitated diphtheria toxoid for the immunization of humans. It is generally recognized that alum-precipitated diphtheria toxoid is a more effective antigen than fluid formol toxoid. Potassium alum, although increasing the antigenic activity of the fluid toxoid, gives rise, in a small percentage of individuals, to sterile abscesses. It is known that this is more likely to occur with high percentages of alum. The development of sensitivity to diphtheria protein, following the use of alum-precipitated toxoid, is likely to be more frequent than following fluid toxoid. Reactions have been reported in humans (1). Experimentally, guinea pigs given alum-precipitated toxoid subcutaneously, followed in two to three months by an intradermal injection of fluid toxoid, exhibit marked skin reactions and if the fluid toxoid is given intravenously, death from anaphylactic shock results (2).

It was felt that a toxoid precipitated with a smaller amount of alum might prove to be satisfactory antigenically and possess to a lesser degree the disadvantages associated with a high alum content. The amount of alum commonly employed varies between one and two per cent. In this report the results obtained with toxoid containing 1.0 and 0.5 per cent alum are presented.

METHOD

The study included individuals in two different age levels, namely, school children (groups 1, 2, and 3, Table I) and university students (groups 4 and 5, Table II). None had received previous artificial immunization. Groups 1 and 2 were composed of individuals possessing less than 0.001 unit of antitoxin as determined by titration of blood serum. In group 3 the individuals were selected on the basis of a positive Schick test.* The children in this group were mostly from the first grade and had lived in a city where the incidence of diphtheria was extremely low. The fourth group was made up of fifth-year medical students who were positive to two Schick tests a month apart. It is recognized that the Schick test itself may serve as a secondary stimulus and the second test was given in order to rule out individuals who would respond to minute amounts of diphtheria antigen and therefore would not be suitable for the evaluation of a toxoid. Out of a group of 30 students tested in this way, 5 individuals who were

**Schick test with control.*

Schick-positive on the first test and negative on the second were rejected. Only 16 of the remainder completed the experiment. The fifth group was also composed of fifth-year medical students but the double Schick-testing was not feasible and all those positive to one test were included.

Data relating to the administration of toxoid and the antitoxin response in the 5 groups are summarized in Tables I and II. The toxoid used for immunization of groups 3, 4, and 5 was identical while that used for groups 1 and 2, though different lots, was of the same Lf value. In all groups blood was drawn 1 to 3 months following the second dose of toxoid and the serum titrated by the Fraser modification of the Römer test (3).

TABLE I

DIPHTHERIA ANTITOXIN RESPONSE TO ALUM-PRECIPITATED TOXOID IN SCHOOL CHILDREN

Group No.	Locality	No.	Titre or Schick Status	Toxoid Injected					Time of Bleeding	Percentage Distribution Titres			
				Number Doses	Interval	Total Amount	Lf	% Alum		0.001 & >	0.001 & >	0.01 & >	0.1 &>
1.	Toronto and Winnipeg	181	<1/1000	2	4 weeks	2 cc.	20	1.0	3 mos.	97	96	89	48
2.	Espanola	60	<1/1000	2	8 weeks	2 cc.	20	0.5	5 wks.	98	98	98	73
3.	London	44	Schick+	2	8 weeks	1 cc.	20	0.5	5 wks.	100	100	100	48

Results using Alum-Precipitated Toxoid (1 per cent):

A group of 181 school children (group 1) whose blood contained less than 0.001 unit of antitoxin were given 2 doses of toxoid of 1 cc. each, 4 weeks apart. Blood was drawn 3 months later and the antitoxin content determined. The results, as summarized in Table I, show 96 per cent to possess 0.004 unit or more, which is the generally accepted level of "Schick immunity". Eighty-nine per cent had 0.01 unit or greater while 48 per cent had 0.1 unit or more.

Results using Alum-Precipitated Toxoid (0.5 per cent):

A group of 60 school children (group 2) whose blood titres showed less than 0.001 unit of antitoxin were given two doses of toxoid of 1 cc. each, 8 weeks apart. Blood samples were taken after 5 weeks and serum titrations showed a very satisfactory antitoxin response. Only 2 per cent failed to respond within the limits of the test while 98 per cent had 0.01 or more and 73 per cent had 0.1 unit or more.

Another group of 44 Schick-positive school children (group 3) were given two doses of 0.5 cc. each, 8 weeks apart. Bloods in this group similarly were drawn after five weeks. All children showed a response of 0.01 unit or more and 48 per cent of 0.1 or more. Seven of these children received a Moloney or reaction test at the time of the taking of the blood sample. Of these, 4 (57 per cent) showed a positive reaction to this skin test with dilute toxoid (0.1 Lf./cc.).

TABLE II

DIPHTHERIA ANTITOXIN RESPONSE TO ALUM-PRECIPITATED TOXOID IN MEDICAL STUDENTS

Group No.	Locality	No.	Schick Status	Toxoid Injected					Time of Bleeding	Percent Distribution Titres		
				Number Doses	Interval	Total Amount	Lf	% Alum		0.001 & >	0.01 & >	0.1 & >
4.	Toronto	16	Schick pos.	2	4 wks.	1.0 cc.	20	0.5	4 wks. to 16 wks.	81	69	25
5.	Toronto	21	Schick pos.	2	16 wks.	1.0 cc.	20	0.5	8 wks.	100	90	62

The fourth group, summarized in Table II, consisted of 16 medical students who were positive to two Schick tests a month apart. Two doses of 0.5 cc. each of the antigen were given 4 weeks apart. Blood samples were taken, in general, 4-8 weeks after the second dose. In the case of three of these individuals the time interval was longer: viz. one at 10 weeks and two at 16 weeks. As shown in Table II, only 81 per cent had 0.001 unit or more, 69 per cent 0.01 or more, and 25 per cent 0.1 or more. Ten members of this group were given a reaction test 5 months after the last dose, to detect the development of any sensitivity. Only 2 (20 per cent) showed a positive reaction. Four individuals, not shown in the table, received one dose of 0.5 cc. only. None developed any demonstrable antitoxin.

The fifth group inoculated, consisting of 21 medical students, received two doses of 0.5 cc. each, given 16 weeks apart. Blood samples were taken 8 weeks after the last dose and the antitoxin content determined. The results were more satisfactory than in the previous group. All showed the presence of antitoxin, 90 per cent had 0.01 unit or more and 62 per cent had 0.1 unit or more. No reaction test was performed on this group.

DISCUSSION

In carrying out such field experiments, it is difficult to avoid the introduction of a number of variables. Some of these may be of minor importance but must nevertheless be considered in evaluating the results obtained.

In comparing groups 1, 2, and 3 of Table I there were at least six variables: the number in each group, the interval between doses, the lot of toxoid, the amount of toxoid given, the percentage of alum in the toxoid, and the time of bleeding after the last dose. It is apparent, however, that diphtheria toxoid containing 1.0 per cent alum and given in two 1.0-cc. doses 4 weeks apart (group 1) results in a satisfactory antitoxin response, 96 per cent reaching the Schick level (0.004 unit) or greater. An even better response is obtained (group 2) when toxoid containing only 0.5 per cent alum is given in two 1.0-cc. doses with an interval of 8 weeks between doses, 73 per cent showing 0.1 unit or more as compared with 48 per cent for group 1. This finding suggests that the interval between doses is more important than

the amount of alum in the toxoid. That a longer interval between doses enhances the antitoxin response has been reported previously (4). The time of bleeding after the last dose of toxoid was different for the two groups and this might account for some of the difference but is probably of minor significance. In group 3 the antitoxin response was equal to or slightly better than that of group 1 although the total dosage was 1.0 cc. instead of 2.0 cc. and the alum content 0.5 per cent instead of 1.0. Again this favourable comparison is likely due to the longer interval between doses, 8 weeks instead of 4. The antitoxin response in group 3 is, however, significantly less than in group 2, the percentage reaching 0.1 unit or more, being 48 and 73 respectively. This difference is possibly accounted for by the smaller amount of antigen given. Our results with 0.5 and 0.5 cc. of alum-precipitated toxoid (0.5 per cent) 8 weeks apart are comparable with the antitoxin response obtained when 2 doses of 1.0 cc. of toxoid containing 1.9 per cent of alum are given 3 weeks apart (5).

In group 4 where 2 doses of 0.5 cc. each of toxoid containing 0.5 per cent alum was used, no antitoxin increase was detected in 19 per cent and only 25 per cent reached 0.1 unit or greater. This poor result could be accounted for by the short interval between doses (4 weeks) and by the rigid way in which the individuals were selected as explained above, those who would respond most readily having been eliminated by a second Schick test, and possibly by the age factor. The number in this group is too small to make any valid comparisons with the previous groups. With group 5, however, in which selection was on the basis of a single positive Schick test and in which an interval of 16 weeks elapsed between doses, a satisfactory response was obtained, 62 per cent showing 0.1 unit or more.

The possibility of sensitization to diphtheria toxoid or diphtheria protein was investigated in a limited way only. Of the two small groups tested, the reaction to dilute toxoid injected intradermally was positive in 57 and 20 per cent respectively. Since the interval between doses was 8 weeks in the first case and 4 weeks in the second, it would appear that development of sensitivity is related to the time elapsing between doses. No general reactions or sterile abscesses were encountered.

CONCLUSIONS

Diphtheria toxoid of low alum content (0.5 per cent potassium alum) is capable of eliciting a good antitoxin response.

The antitoxin titre is increased by lengthening the interval between doses of toxoid.

The total amount of toxoid given is important, i.e., 2 cc. gave a higher antitoxin titre than 1 cc.

Skin sensitivity may occur following the use of diphtheria toxoid with a low alum content. The interval between doses of toxoid may be important in the development of this sensitivity.

REFERENCES

1. Harrison, W. T.: Am. J. Pub. Health, 1935, *25*:298.
2. Moloney, P. J. and Orr, M. D.: J. Path. & Bact., 1938, *47*:315.
3. Fraser, D. T.: Trans. Roy. Soc. Canad., 1931, *25* (Sec. V):175.
4. Fraser, D. T.: Canad. Pub. Health J., 1939, *30*:469.
5. Volk, V. K., and Bunney, W. E.: Am. J. Pub. Health, 1942, *32*:690.

The Contribution of the Association's Vital Statistics Section to National Vital Statistics*

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THIS meeting is probably the most important in the history of the Vital Statistics Section of the Association. A three-day Dominion-Provincial conference on vital statistics opens tomorrow. At this conference, which comes just twenty-five years after the foundations of national vital statistics were laid in 1918, not only will all official, federal and provincial bodies be represented, but also those voluntary groups which are vitally concerned with the problems to be discussed. Among these latter bodies are the Canadian Medical Association and the Canadian Public Health Association.

Despite the fact that Canadian national vital statistics had their beginning only as recently as 1918, the achievements in the space of a short quarter-century have been remarkable. Credit for this goes in large measure to the co-operative efforts of the Dominion Statistician and his colleagues and the responsible provincial authorities. In the developments of the last fifteen years, the work of the Canadian Public Health Association has been of significance, particularly in relation to technical considerations of a medical or public health nature.

The Vital Statistics Section of this Association was organized in 1928 and under the successive chairmanship of Dr. Coats, Mr. Manchester, the late Drs. Warwick and Gagnon, and others, the groundwork for the development of an active Canadian group of workers was laid. During the fifteen years since the organization of the Section, many contributions of value to the Dominion Bureau of Statistics and to Provincial Departments have been made. These contributions have been made through the work of special committees on problems relating to the phraseology of the physician's statement of cause of death, the revision of the International List of Causes of Death, the education of physicians and medical students in the fundamentals of vital statistics, the definition of and other problems relating to stillbirth, classification by place of residence, and latterly the confidential death certificate.

In June, 1938, a conference was held in Ottawa to discuss with representatives of the Dominion Bureau of Statistics the reports of this Section's committees on stillbirth registration, the classification of causes of illness and the confidential death certificate. Following the deliberations, in which representatives of several life insurance companies participated, a committee was appointed to consider the subject of confidential certification with the Department of Pensions and National Health, the Dominion Bureau of Statistics, the Provincial Departments con-

**Presented at a conference of the Vital Statistics Section, Canadian Public Health Association, held in the Chateau Laurier, Ottawa, on October 6, 1943.*
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cerned, and the Actuaries Club. The work which was planned by this group has been held in abeyance because of the war but the issue is one of vital concern and must be carried forward as soon as it becomes possible to do so.

It is most opportune, in view of the forthcoming Dominion-Provincial conference on vital statistics, for us to consider carefully the position of the Vital Statistics Section in the future. As a national voluntary agency, with membership drawn from all parts of the country, it is the logical scientific body to serve as a clearing-house for the medical profession in Canada in respect to the public health and medical aspects of vital statistics. The accomplishments of the past are sufficient support of this point.

If there is agreement upon this principle, it behooves us to take such action as will ensure the effective implementing of the objective. This will require the extending of the membership, representation and interest in the Section, the setting up of additional committees which are nationally representative, the establishing of closer liaison with such other medical bodies in Canada as the Canadian Medical Association and the Canadian Tuberculosis Association, and the strengthening of existing relationships with the Dominion Bureau of Statistics, the Department of Pensions and National Health and all provincial health departments.

I believe that this objective for the Section can be attained and that the Association can make useful contributions on a broader base than in the past. There are many problems which will require our consideration in the near future. Among these may be mentioned: the classification of the causes of sickness; the form and content of annual vital statistics reports; the setting up of rules of vital statistical practice comparable in nature and scope with those set up by the American Public Health Association. These problems are additional ones to those for which committees have already been set up and whose work will, of course, have to be continued.

Principal of the issues constantly before all who use or are responsible for vital statistics, are the joint problems of reliability and comparability of mortality records. Comparability and reliability (accuracy) depend upon many variables, among which may be mentioned:

(*a*) The physician's clinical knowledge of the case.
(*b*) The knowledge of the physician as to what is desired on the medical certificate.
(*c*) Understanding by the physician of the questions relating to cause of death.
(*d*) Familiarity with the International List of Causes of Death.
(*e*) The application of rules of selection where multiple causes are stated.
(*f*) Errors in the preparation of transcripts used by statistical bureaux.
(*g*) Actual mis-statement of cause of death.
(*h*) Unsatisfactory certification.

If we recognize these limitations (either on a national or international scale) and admit, as we must, that from the public health standpoint the chief objective of mortality records is to serve as an indicator of trends and to direct the attention of those competent authorities concerned to points at which prevention and con-

trol measures may be applied to best advantage, then we must be genuinely concerned. Since the Association and this Section are interested particularly in those aspects of vital statistics which pertain to health, we are forced to recognize that, at the moment, not only is international uniformity largely a myth but so also is national uniformity. These are facts and they must be clearly appreciated if we are to do anything toward satisfactorily solving the problems which are involved and recommend such action as may best result in making mortality statistics, and vital statistics generally, fit better the objective.

In connection with existing limitations of records made on official forms by physicians particularly, committees of this Association are presently concerned particularly with such action as may improve the situation and to this extent the Association has, through its Committee on Certification of Causes of Death, done a good deal to advance the teaching of vital statistics. Much more remains to be done in this field, however, and it is evident that the committee's work in the future must be extended rather than curtailed.

Recognition of this Section as a clearing house for the medical profession in Canada in respect to problems in vital statistics is, therefore, indicated. There is no doubt that this Section, in bringing together those concerned in vital statistics in the municipal, provincial and federal departments of health, as well as members of life insurance companies, serves a useful purpose. The contribution of the Section in recent years is illustrative of what useful work can be done. Reference may merely be made to the new medical certificate of death, the revision of the International List of Causes of Death, the development of a national stillbirth certificate, improvement in the teaching of vital statistics to medical students, and the education of physicians in the importance of vital statistics.

The contribution by the Section to national vital statistics can and should be even greater in the future than in the past. To achieve the objective there is needed a broadening of representation and of steps to ensure nationally representative opinion on all committees. The Section should undertake to conduct such studies and make such reports and recommendations as may be indicated from time to time and assist, to the maximum degree, the Bureau and other governmental agencies. It will be essential for the Section to effect a close liaison with the other national groups in the conduct of studies involving medical opinion in order that we may succeed in our endeavour to do everything possible to improve reporting and certification and to eliminate sources of error which presently vitiate the value of much of our vital statistical data.

Like other committees of the Association, the committees of this Section should be organized with the stated objective of collaborating with Canadian authorities generally in studies designed for the benefit of all health workers and for the benefit of official bodies such as the Dominion Bureau of Statistics which have looked to this Section for guidance, particularly in respect to medical technical problems.

The Use of Volunteers in Public Health Nursing

REPORT OF A SUBCOMMITTEE OF THE STUDY COMMITTEE,
PUBLIC HEALTH NURSING SECTION
CANADIAN PUBLIC HEALTH ASSOCIATION

AT the annual meeting of the Canadian Public Health Association in June, 1942, a subcommittee on the use of volunteers was appointed by the Study Committee of the Public Health Nursing Section. In order to facilitate its study, a small local committee consisting of Miss Esther Beith, Miss Mary Mathewson, Miss Marion Nash, and Miss Mary Ritchie (chairman) was appointed. At the preliminary meeting, ways and means of finding out where volunteers were being used, their duties, and the need for them in the health field, were discussed. Mrs. J. Pembroke of the Montreal branch of Women's Voluntary Services, and Mrs. W. E. West, National Director of Women's Voluntary Services, offered to assist in securing more volunteers for the health field if the needs were known.

At that time a survey of nursing was being made by the Canadian Nurses Association under the auspices of the Canadian Medical Procurement and Assignment Board. In order to eliminate an additional questionnaire, Miss K. W. Ellis, director of the survey, was kind enough to allow the questions concerning volunteers to be included in the section of the survey relating to public health nursing. A summary of the information is appended. Thirty official and six voluntary agencies, including the Victorian Order of Nurses (National), reported the use of volunteers. Ten of the official and three of the voluntary agencies stated that they could use larger numbers. The volunteers were obtained through women's service clubs, the Junior League, and personal contacts. For the most part their duties consisted of clerical work and assistance in child health centres. Two volunteer agencies reported that volunteers had been used in home visiting. The official agencies in Nova Scotia, New Brunswick, Prince Edward Island, Quebec, and Alberta reported that no volunteers were used.

Outlines of training programs were obtained from various agencies in Canada. After surveying the Canadian field, the committee felt that it would be well to know something of the experiment which had been carried out by the Bureau of Nursing of the Department of Health of New York City with "volunteer health assistants." It was learned that by the fall of 1941 the Department of Health had begun to feel the need of some assistance in order to meet the increasing demands on the nursing service. One year later, 400 volunteer health assistants were being used, and in May, 1943, a campaign was inaugurated to obtain 1500 additional volunteers. It was felt that the success of the program was due in a large measure to the fact that the supervision and leadership were left with the volunteers.

The committee suggests the following outline for the selection, training, duties, and supervision of volunteers:

1. *Selection:* Through the local branches of the Women's Voluntary Services.

2. *Training course:* To be given by health agencies and to consist of a discussion of (a) the place of volunteers in health organizations, (b) the community set-up, (c) organization set-up, and (d) duties of volunteers (with demonstrations).

3. *Duties which may be performed by volunteers under the supervision of a nurse:*

(a) *In schools:* Weighing and measuring; taking temperatures; testing vision; applying dressings; doing clerical work; taking care of supplies and equipment.

(b) *In clinic services:* Greeting new mothers and patients, making sure the nurse knows that they are in the clinic; directing mother or patient to doctor in turn; weighing and measuring; taking temperatures; taking patients to clinic; doing clerical work; taking care of material and equipment; supervising play rooms in child health centres (a play-room volunteer should have special training if possible).

(c) *In a visiting-nurse organization:* Preparation of supplies and dressings; care of material and equipment; clerical work.

Volunteers may also serve in homes. An experiment has been carried out in home visiting in some centres in the United States and in one centre in Canada. Anything done along these lines should be carefully controlled and considered in the nature of an experiment.

4. *Supervision:* If at all possible, volunteers should be supervised and directed by volunteers under the direction of the nursing personnel.

The committee appreciates the desirability of using more volunteers and using them effectively in the public health nursing field. At the same time, they realize that the burden of training volunteers will fall upon the public health nurse. The training program suggested is, therefore, brief, but it will cover the essentials and maintain the interest of the volunteers.

The committee further suggests that, in view of the shortage of nurses, the findings of the survey regarding the use of volunteers, and the outline of the training plan and of the duties to be performed as suggested by this committee, be made available to health departments and other health organizations which may be interested. To obtain volunteers, they should be urged to get in touch with the local branch of Women's Voluntary Services where such exist. The committee considers it most important that the volunteer programs should have volunteer leadership under the direction of the nursing personnel.

APPENDIX

THE USE OF VOLUNTEERS IN PUBLIC HEALTH NURSING

SUMMARY OF INFORMATION OBTAINED FROM THE CANADIAN NURSES ASSOCIATION'S SURVEY OF NURSING (PUBLIC HEALTH NURSING SECTION) MADE UNDER THE AUSPICES OF THE CANADIAN MEDICAL ASSIGNMENT AND PROCUREMENT BOARD

A. OFFICIAL AGENCIES

Agency	No.	Total Hours	More Needed	No.	How Secured	Qualifications	Training Plan	Supervised	Duties	Remarks
Metropolitan Health Committee, Vancouver	40	2,588	Yes	20	Parent-Teacher Association, Junior League Volunteer Bureau	Interested, mature, stable	Yes	Yes	Admitting, clerical, child health centre, weighing, assistance with immunizations	Could use volunteers in schools
Health Department, Winnipeg	2+6	560	Yes	–	Volunteer Bureau	Set by Vol. Bur.	Yes	Yes	Weighing, clerical, assistance with immunizations, child health centre	
Woodstock, Ont	2	60	Yes	?	St. John Ambulance	St. J. A. courses	No	By P.H.N.	Immunization and clerical	
Ingersoll, Ont	2	115	No	–	King's Daughters	None	No	Yes	Clerical at child health conference	
London	15	1,000	Yes	2	May Court Club	Graduate nurse if possible	No	Yes	Child health centre and chest clinic	2 required for chest clinic
Wallaceburg, Ont	1	126	No	–	Volunteer from community		No	No	Child health centre, 3 hours weekly	Is graduate nurse
North and South Dumfries and Ayr, Ont	–	–	2	–						For child health centre
Galt, Ont	5	300	No	–	Personal contact		No	Yes	Child health centre	3 graduate nurses and 2 others
Hamilton	28	–	–	–	Junior League, Women's Auxiliary to Health Centre	Intelligent, interested	Yes	Yes	Child health centre, prenatal	
St. Catharines	?	208	Yes	?	May Court Club		No	No	Child health centre, clerical and weighing	
Owen Sound	1	104	–	–	Volunteer offer or by request		No	Yes	Child health centre	
Timmins	40	336	–	–	Women's service club organized for purpose	No home ties	No	Yes	Child health centre and immunization	
Kirkland Lake	1	4 wkly.	–	–			No	No		Married nurse
Haileybury	6	25	No	–	Volunteered		Yes	Yes	Clinic assistance, assistance with lectures and demonstrations, home nursing.	3 graduate nurses and 3 others
Weston	2	100	No	–	Volunteered		No	Yes	Clinic and recording	1 graduate nurse
East York	9	500	No	–	Church and personal contact	No	No	Yes	Clerical	
North York	2	40	No	–	Volunteered	Reg. Nurse	–	–	Child health centre	
Dundas	1	60	–	–			–	–	Immunization clinic	
Welland	1	150	No	–	Personal contact	Quiet, intelligent	No	Yes	Child health centre and immunization	
Thorold	1	2 wkly.	–	–			–	Yes	Child health centre	

Agency	No.	Total Hours	More Needed	No.	How Secured	Qualifications	Training Plan	Supervised	Duties	Remarks
New Toronto	2	24	—	—	Personal contact		—	Yes	Immunization clinic	
Toronto	110	7,152	Yes	18	Volunteers, members of Nursing Division, Women's Voluntary Services	Interest, regularity, punctuality	Yes	Yes	Child health centres, schools, clerical, nursing (for graduate nurses)	16 graduate nurses
Peterborough	4	200	No	—	Junior Welfare League		No	Yes	Child health centre and chest clinic	
Brockville	4	24	No	—	Personal contact	Reg. nurse	No	No	Immunization	4 reg. nurses
Perth	6	26	Yes	?	Personal contact	Grad. nurse, Red Cross or St. J. Ambul.	Yes	Yes	Immunization clinics, clerical	2 reg. nurses
Ottawa	3	2 wkly.	No	—	May Court Club	First Aid	No	Yes	Child health centre	
Lindsay	1	3 wkly.	No	—	Volunteered		—	—	Child health centre	
Stamford	1	2 wkly.	No	—	Volunteered		—	—	Clerical	
North Bay	5	No rec.	Yes	1	Personal contact		—	No	Child health centre, immunization	1 required for clerical work
Edmonton	Does not use any but could if they were trained.									

The official agencies in Prince Edward Island, Nova Scotia, New Brunswick, Quebec and Alberta (with the exception of the City of Edmonton) reported that they did not use the services of volunteers. In British Columbia, some volunteers are used in the districts served by one nurse, but no records are available.

B. VOLUNTARY AGENCIES

Agency	No.	Total Hours	More Needed	No.	How Secured	Qualifications	Training Plan	Supervised	Duties	Remarks
Infant Homes, Toronto	Many	—	—	—	Women's Volunteer Services		—	—	Receiving, home, clerical, driving, assistance in clinics, clothing room	
Mothercraft Society, Toronto	20	—	—	—			—	—		1 graduate nurse, 19 others
Child Welfare Association, Montreal	24	1,800	Yes	?	Junior League, personal contacts, women's service clubs		No	Yes	Assistance in clinics, visiting in homes, clerical	1 graduate nurse, 23 others
Royal Edward Institute, Montreal	1	15 wkly.	Yes	2	Personal contact			Yes	Clerical	1 graduate nurse
Hespeler District Nursing Association, Ontario	4	—	—	—			—	—	Child health centre	
Victorian Order of Nurses (National)	115	3,515	Yes	11	Junior League and local committee, Central Voluntary Bureau, Red Cross, women's clubs, school teachers	Interest, responsibility, adaptability, pleasing personality	In 3 branches	Yes	Clinics, clerical, making of dressings and supplies, assisting nurse in care of patients in home (these must have St. John or Red Cross certificate)	28 graduate nurses

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THE NATIONAL VENEREAL-DISEASE CONTROL CONFERENCE

A NATIONAL venereal-disease control conference was held in Ottawa December 6th to 9th. It was excellently planned and arranged under the direction of Lt.-Col. Donald H. Williams, Chief of the Division of Venereal-Disease Control in the Department of Pensions and National Health, and Army Venereal-Disease Control Officer in the Department of National Defence.

Following the appointment of Colonel Williams last spring to direct the venereal-disease control program in Canada, a national program was outlined. Stressing the fact that there are four sectors in the front against venereal disease —namely, the health, welfare, legal and moral sectors—Colonel Williams has planned to unite and co-ordinate these components in an effective control program. The national conference was arranged to consider the program, and was in particular an occasion for the detailed consideration of the "health sector". The conference therefore dealt primarily with medical and legal problems. There might well be similar conferences for the detailed discussion of the social and moral aspects of venereal-disease control. Such conferences might be provincial or local, but however held they are essential to the development of sound public opinion supporting the efforts of the medical profession and public-health administrators.

The conference was attended by representatives of the armed services, provincial and municipal departments of health, university departments of preventive medicine, the Canadian Medical Association, the Canadian Hospital Council, the Health League of Canada, and the Canadian Public Health Association. In the group of approximately one hundred medical personnel were representatives from the United States, the United Kingdom, and Australia. The conference was greatly indebted to the visiting representatives for their helpful participation in the discussion.

The members endorsed the program outlined by Colonel Williams for a nation-wide attack against venereal disease. The six-point program includes the provision of dignified but completely honest and open-minded education of the public; adequate diagnostic and treatment facilities; early, adequate prenatal

care, including blood tests of expectant mothers; general health examinations, including blood tests before marriage; the suppression of quackery in treatment; and measures to deal with community conditions and persons found to be responsible for the spread of venereal disease.

During the conference, committees on Administration, Records and Statistics, Diagnostic and Therapeutic Procedures, Epidemiology, and Education and Community Problems studied pertinent problems and presented resolutions. The conference recommended that legislation should be drafted by the Dominion Council of Health, based on existing venereal-disease control Acts, to bring about uniform, effective legislation throughout Canada. The Committee on Administration recommended that the Criminal Code be amended to make jail sentences mandatory for men found in houses of prostitution and that heavy penalties be imposed on the owners of property and proprietors who are profiting from the operation of houses of prostitution. It was suggested that the penalties should be similar to those imposed on persons trafficking in narcotic drugs. A further amendment to the Criminal Code was urged to allow the holding in custody of inmates, operators, and those found in houses of prostitution until it is ascertained whether they are free from venereal diseases. The conference considered the report of the committee dealing with premarital, prenatal and preëmployment blood tests, but no action was taken in regard to recommending that the tests be made compulsory.

In discussing the incidence of syphilis and gonorrhoea, it was stressed that the public should be given full information concerning the number of cases occurring in both the civilian population and the armed services. In the United States this information is made public. It will indeed be surprising if Canada's effort to control venereal diseases is permitted to be hampered by the lack of this essential information. Without accurate figures, the public tends to lose confidence as conflicting estimates are presented, and exaggerated or misleading statements made. In this connection, it was announced by the Department of Pensions and National Health that, beginning early in January, a survey will be made of the incidence of these disease in Canada, including all public institutions. New report forms will be in use and will afford data weekly from all parts of the Dominion.

Those concerned with the magnitude of the venereal-disease problem in Canada today are not without hope that this time the effort will be a vigorous, sustained and successful one. Our record in venereal-disease control is not good. During the last war an energetic and realistic campaign against venereal disease in the army was carried on, chiefly through the vision of the late Dr. J. G. FitzGerald and Dr. Gordon Bates. The epidemiological approach was made through the confidential case recording initiated by Dr. Bates; and it is of interest to note in passing that this form as a basis of case finding was accepted in its entirety by the army of the United States. Very effective and, at that time, novel legislation was urged and finally adopted in Ontario and in other provinces. In May, 1919, six months after the close of the war, a conference was called in Ottawa

by the Acting Premier, Sir Thomas White, for the purpose of devising ways and means of combating the venereal diseases, which were widespread among the civilian population. As a result of investigations undertaken by the military authorities, attention had been directed to the seriousness of the situation, and a meeting of health officials held in February of that year had recommended that the larger conference be planned to discuss a comprehensive scheme for dealing with the situation. A resolution passed by the conference called the attention of the Dominion Government to the necessity for provincial subsidies for fighting the venereal diseases. One immediate result of the conference was the formation of the Canadian National Council for Combating Venereal Diseases, now the Health League of Canada, of which Dr. Gordon Bates has been the leader since its inception. One year after the creation of the Federal Department of Health in 1919, a special division for the control of venereal diseases was established in the department and a grant of $200,000 was made available annually to assist the provinces in establishing venereal-disease clinics. Thus the federal and the provincial authorities undertook a co-ordinated program for the control of venereal diseases. Within a relatively short period of time, however, interest and support began to weaken, and in 1932 the Dominion Government ceased entirely its policy of grants-in-aid and disbanded the Division of Venereal-Disease Control. Fundamentally, effective venereal-disease control must rest on a Dominion-Provincial partnership in safeguarding and advancing public health. The policy of grants-in-aid for all public health work must be adopted by the Federal Government if adequate control measures are to be made possible against venereal and other preventable diseases, and if health services are to be provided for the vast areas of Canada where full-time services of medical officers of health and other personnel are not available.

Now, only after four years of war, in spite of a full knowledge that the incidence of venereal disease would increase, one sees the same pattern being followed. A conference has been called, for the same reason that one was called in 1919—the alarming increase in venereal disease in Canada, both among the armed forces and the civilian population; and with the same objective—the planning of a comprehensive program for the control of these diseases. This is not to say that the present campaign should be discouraged. It should, on the contrary, be enthusiastically endorsed and vigorously supported. Much more important, it must be sustained. The opportunity is at hand for an effective, nation-wide campaign. There must not be any diminution of interest, effort, or financial support until the venereal diseases have been brought under control. At present, the most obvious problem is that of minimizing the incidence of venereal disease by every means at our disposal. Eventually the emphasis must be upon basic sociological research into the factors concerned with a normal sex life and the realization that the problem of venereal diseases is primarily social and moral, and secondarily medical.

ASSOCIATION NEWS

THE 1943 EXAMINATIONS FOR THE CERTIFICATE IN SANITARY INSPECTION (CANADA)

THIS year's examinations for the Certificate in Sanitary Inspection (Canada) were held in Edmonton, Regina, Winnipeg, Toronto, Montreal, Saint John, and Halifax on September 15th, 16th and 17th. There were twenty-six candidates and with but one exception all were successful. The following have been granted the Certificate:

Alberta: Hugh Bownes, Stettler; Ian Douglas Frank Shaw, Edmonton; William Alexander Milligan, Edmonton.

Saskatchewan: Francis Paul Peters, Regina; Jack Cornelius Rink, Regina.

Manitoba: Allan Bereskin, Winnipeg; Dorothy Grace Roberts, Winnipeg.

Ontario: Douglas George Barnett, Toronto; William George FitzSimons, Toronto; Leonard Hardwick-Harding, Toronto; Albert Frank Holmes, Toronto; Harold Walter Jones, Toronto; J. Emile Lapointe, Ottawa; Patrick Henry Murphy, South Porcupine; Albert William Thompson, Kingston; Carl Bale Voaden, St. Thomas.

Quebec: Clifford Albert Victor Barker, Macdonald College; Rodolphe Leon Casavant, Cookshire; Joseph Dufresne, Oka; J. Robert Ferland, Montmagny; Raymond Jalbert, Montreal; Paul Roger, Montreal.

New Brunswick: George James Duncan, Saint John.

Nova Scotia: Thomas Finlay Hotchkis, Amherst; Alexander Robert Ross, Meadowville.

As in past years, the responsibility for conducting the examinations was left with the Provincial Departments of Health, and the chairman of the provincial board was appointed by the Deputy Minister. The second member was chosen by the chairman, and the third was nominated by the Canadian Institute of Sanitary Inspectors. The Committee on the Certification of Sanitary Inspectors gratefully acknowledges the co-operation of the following members:

Alberta: Mr. D. B. Menzies (chairman), Dr. G. M. Little, and Mr. J. Butterfield.

Saskatchewan: Mr. J. G. Schaeffer (chairman), Dr. George Walton, and Mr. M. H. Kennedy.

Manitoba: Dr. C. R. Donovan (chairman), Mr. W. D. Hurst, and Mr. James Arkle.

Ontario: Dr. J. G. Cunningham (chairman), Dr. L. A. Pequegnat, and Mr. Hugh McIntyre. In addition, Dr. A. R. B. Richmond, Dr. F. O. Wishart, and Mr. D. S. McKee assisted with the oral examinations.

Quebec: Mr. Théo. J. Lafrenière (chairman), Dr. Adelard Groulx, and Mr. L. P. Cabana. Dr. A. J. G. Hood assisted with the oral examinations.

New Brunswick: Dr. C. W. MacMillan (chairman), Dr. Arnold Branch, and Mr. John N. Flood.

Nova Scotia: Dr. P. S. Campbell (chairman), Dr. D. J. MacKenzie, and Mr. H. W. Johnston.

The examinations in the three written papers were as follows:

EXAMINATIONS FOR THE CERTIFICATE IN SANITARY INSPECTION (CANADA), SEPTEMBER, 1943

SANITATION

(Thursday, September 16th, 2-5 p.m.)

1. (*a*) Name three different types of wells. Illustrate by a sketch the ground formation in each of the types mentioned.

(*b*) What are the essentials in the construction of a safe well?

(*c*) What hazards may exist to wells in limestone formation?

2. Describe the design and construction of a septic-tank installation suitable for the disposal of sewage from a boys' school which accommodates 50 boys together with the necessary staff. The ground adjoining the school is heavy clay. Supplement your answer by a sketch indicating the approximate dimensions of the various parts of the installation.

3. (*a*) What are the constituents of refuse from a city?

(*b*) Describe the methods which may be employed in the disposal of refuse, mentioning advantages and disadvantages of each method.

4. State the type of material used and the purposes of the following parts of a plumbing system of a residence, illustrating by a sketch:

(*a*) House drain.

(*b*) Fresh-air vent.

(*c*) Soil pipe.

(*d*) Trap on water closet.

5. (a) Outline the proper care and disposal of horse manure to prevent fly-breeding.

(*b*) Define "overcrowding" in relation to housing.

(*c*) Outline the essentials of satisfactory ventilation, heating and lighting for a school building for 200 pupils.

(*d*) Describe a method of chlorination of water for use at a summer camp.

FOOD CONTROL AND PUBLIC HEALTH ORGANIZATION AND LEGISLATION

(Friday, September 17th, 9.00 a.m.-12 noon)

PART I—FOOD CONTROL

1. (*a*) Outline the inspection of a dairy farm by a milk inspector.

(*b*) Why is it essential to require pasteurization of milk in addition to adequate inspection of dairy farms?

(*c*) Define "pasteurization of milk".

(*d*) What are some of the defects which may be found in pasteurization plants and which may result in unsatisfactory pasteurization?

(*e*) What laboratory evidence would indicate that there have been defects in the operation of a pasteurization plant?

2. (*a*) Enumerate the conditions which call for the condemnation of a carcass.

(*b*) By what officers are carcasses examined in abattoirs?

(*c*) Under whose authority do they act?

(*d*) What authority has the sanitary inspector regarding meat offered for sale?

(*e*) How does proper cooking safeguard the consumer of meat? Illustrate by reference to several diseases.

3. Outline the methods which should be employed in the cleansing and disinfection of:

(*a*) Glasses in a beverage room.

(*b*) Dishes and eating utensils in a small restaurant.

(*c*) Bottles used as containers for soft drinks.

4. Write notes on:

(*a*) Control of cockroaches in a restaurant kitchen.

(*b*) Identification of fish as fresh.

(*c*) Types of food poisoning.

PART II—PUBLIC HEALTH ORGANIZATION AND LEGISLATION

1. (*a*) Name the various divisions of the Federal Department of Pensions and National Health as relating to the field of public health.

(*b*) What is the relation of the Federal Department to provincial and municipal departments of health as provided in the Act establishing the Federal Department?

(*c*) Outline the work of any two of the divisions of the Federal Department of Health.

2. Outline the organization of public health in a city of 100,000 population.

PREVENTION AND CONTROL OF COMMUNICABLE DISEASES AND VITAL STATISTICS

(Friday, September 17th, 2-5 p.m.)

PART I—COMMUNICABLE DISEASES

1. (*a*) Define the term "carrier". Name two diseases in which carriers are important sources of infection in a community.

(*b*) What is meant by a "missed" case? Name two diseases in which "missed" cases are important sources of infection in a community.

(*c*) Discuss the transmission of disease by insects.

2. (*a*) What is the cause of typhoid fever?

(*b*) An outbreak of 10 cases of typhoid fever is reported in a town of 10,000 population. On investigation it is learned that there are cases also in two adjacent towns and one village. Outline the possible methods of transmission which might account for these cases. What steps would be taken by the health department to control the outbreak?

3. What quarantine measures are instituted by the health department when notified of:

(*a*) A case of scarlet fever in a boarding house?

(*b*) A case of diphtheria in the family of an operator of a small dairy plant?

(*c*) A case of anterior poliomyelitis (infantile paralysis) in a private home?

(*d*) A case of smallpox in a construction camp?

4. Write notes on:

(*a*) The method of protecting a child against diphtheria.

(*b*) The control of bovine tuberculosis in cattle.

PART II—VITAL STATISTICS

1. (*a*) What is the value of vital statistics in public health work?

(*b*) What are the sources of vital statistics?

(*c*) How is the death rate from tuberculosis, or any other disease, expressed?

(*d*) What is meant by "infant mortality rate"? What factors may contribute to a high infant mortality rate?

With the granting of the Certificate to twenty-five candidates this year, two hundred and ninety-two inspectors have obtained the Canadian qualifications since the examinations were introduced in 1935.

Twelfth Annual Christmas Meeting

OF THE

LABORATORY SECTION

●

ROYAL YORK HOTEL, TORONTO, DECEMBER 15-16, 1943

●

WEDNESDAY, DECEMBER 15th, 9.15 a.m.

PRIVATE DINING ROOM No. 9
MAIN MEZZANINE FLOOR

Chairman—**F. T. CADHAM, Professor of Bacteriology and Immunology, University of Manitoba; Director of Laboratories for the Province of Manitoba; and Chairman of the Laboratory Section.**

Two cases of Ghon lesion with discussion of the recognition of primary pulmonary tuberculosis by X-ray.

JAMES MILLER and WM. D. HAY, Richardson Pathological Laboratory, Queen's University, Kingston.

Isolation of an anaerobic streptococcus from cases of bovine mastitis.

F. W. SCHOFIELD, Ontario Veterinary College, Guelph.

The adaptation of M. paratuberculosis to artificial culture media prepared without the addition of the "essential growth factor."

H. KONST, Division of Animal Pathology, Science Service, Dominion Department of Agriculture, Animal Diseases Research Institute, Hull.

Resistance to Ascaris lumbricoides infection as demonstrated experimentally in guinea pigs.

A. MURRAY FALLIS, Ontario Research Foundation, Toronto.

Shellfish poisoning in Canada.

J. GIBBARD AND J. R. NAUBERT, Laboratory of Hygiene, Department of Pensions and National Health, Ottawa; and R. E. FOERSTER and J. P. TULLY, Fisheries Research Board, Nanaimo, B.C.

Glanders in man.

C. D. McGILVRAY, Ontario Veterinary College, Guelph.

WEDNESDAY, DECEMBER 15th, 2.15 p.m.

PRIVATE DINING ROOM No. 10
MAIN MEZZANINE FLOOR

Chairman—F. T. CADHAM.

Transmission of Salmonella pullorum by flies.

RONALD GWATKIN and CHAS. A. MITCHELL, Division of Animal Pathology, Science Service, Dominion Department of Agriculture, Anima Diseases Research Institute, Hull.

Bottled media.

HILDEGARDE MACMORINE, Connaught Laboratories, University of Toronto.

A mouse protection test for cholera vaccine.

L. E. RANTA and C. E. DOLMAN, Connaught Laboratories (Western Division), University of Toronto.

Virus Variation.

JAMES CRAIGIE, Connaught Laboratories, University of Toronto.

A Chronic Typhoid Carrier.

A. R. FOLEY, Ministry of Health and Social Welfare, Province of Quebec.

Report of the Committee on Bacteriological Examination of Water and Sewage.

NORMAN J. HOWARD, Department of Public Health, City of Toronto.

WEDNESDAY, 6:30 p.m.

INFORMAL DINNER

PRIVATE DINING ROOM No. 8

Address:

"The Laboratory and Social Medicine"

F. T. CADHAM

Professor of Bacteriology and Immunology, University of Manitoba
Director of Laboratories for the Province of Manitoba
and Chairman of the Laboratory Section

THURSDAY, DECEMBER 16th, 9.15 a.m.

PRIVATE DINING ROOM No. 9

Chairman—F. T. CADHAM.

Influenza.

RONALD HARE, Connaught Laboratories, University of Toronto.

Factors of importance regarding a laboratory examination for rabies.

P. J. G. PLUMMER, Division of Animal Pathology, Science Service, Dominion Department of Agriculture, Animal Diseases Research Institute, Hull.

The survival of E. typhosa in cheddar cheese manufactured from infected raw milk.

A. G. CAMPBELL and J. GIBBARD, Laboratory of Hygiene, Department of Pensions and National Health, Ottawa.

Further observations on staphylococcus enterotoxin.

C. E. DOLMAN, Connaught Laboratories (Western Division), University of Toronto.

Antibacterial activity of citrinin in vitro.

M. TIMONIN, Division of Bacteriology and Dairy Research, Science Service, Dominion Department of Agriculture, Ottawa.

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